The Taiwan Tech Arena in conjunction with the Taiwan Ministry of Science and Technology supported startup program, strives through the integration of various resources to boost innovative startups by linking them with international accelerators and expanding global reach to create more business opportunities.

TURNING PURE WATER INTO A POWERFUL DISINFECTANT

Sanitation Startup EleClean Receives Innovation Award at CES 2019 for the Eco-Friendly Technology

HOW MUCH DO YOU KNOW ABOUT BREATHING?

Genius Holdings' Smart Breathing Tracker ezOxygen Helps You Prevent Lung Ailments

TAIWAN TECH ARENA

TTA

TAIWAN TECH ARENA

JAN. 2019

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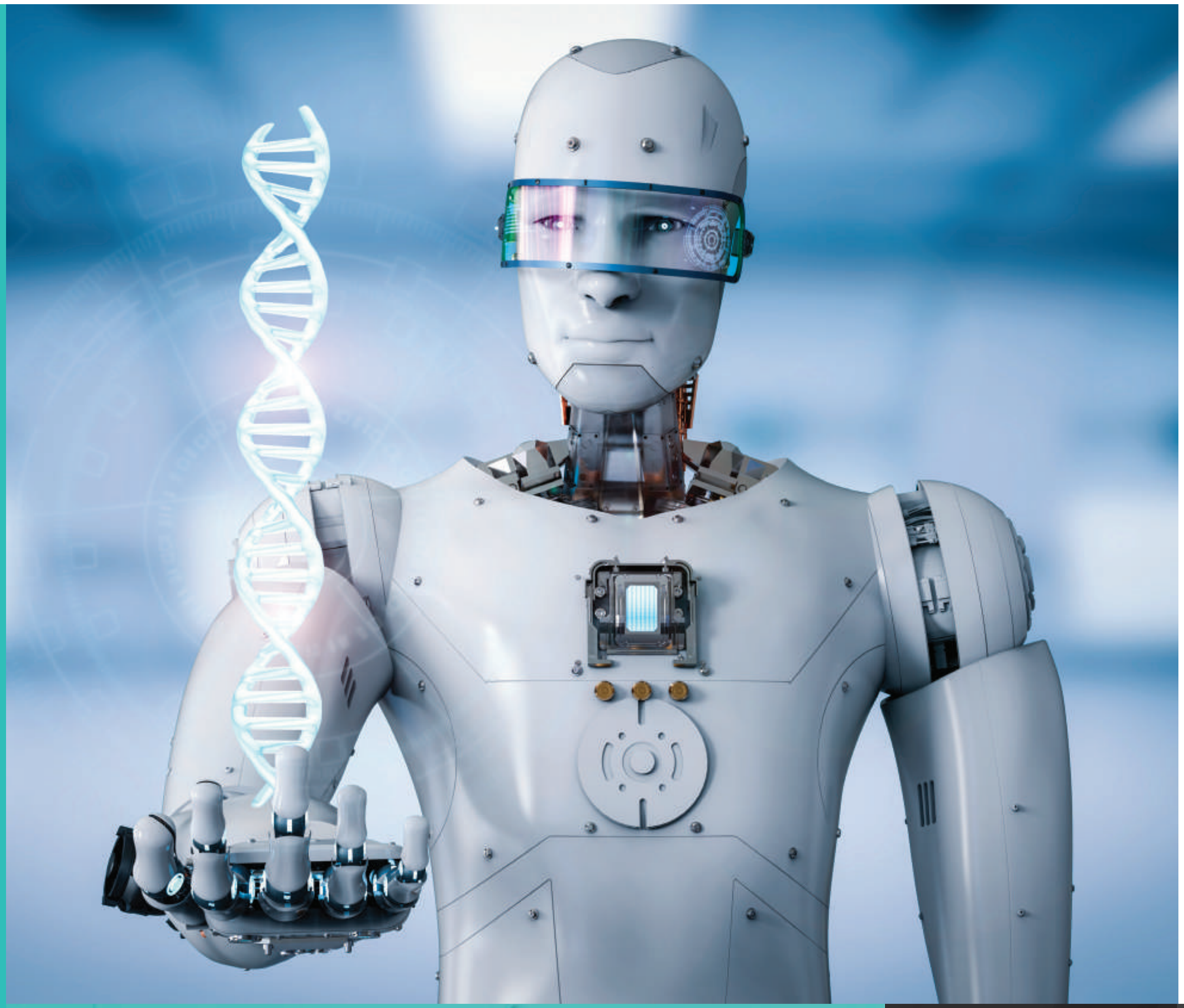

TAIWAN TECH ARENA DEBUTS AT CES 2019

Building an Energetic High Technology Startup Ecosystem in the Fields of AI, Semiconductor and Software Development

TAIWANESE TECH STARTUPS AIM TO USHER IN THE NEXT GOLDEN AGE

Since Moore's Law was proposed about half a century ago in 1965, the global technology sector has been advancing in accordance with the rapid paces of generational changes in semiconductor manufacturing. Roughly every 18 months a new technology node will appear, resulting in smaller and more powerful semiconductor chips. Taiwan spotted opportunities associated with this trend as early as the 1970s, and from then on has continued to create a globally leading semiconductor industry that encompasses IC design, chip production, foundry, and OSAT.

Taiwan has three distinct advantages when facing the unknown future in technological developments. First, our industries possess the core technologies, especially those related to semiconductor manufacturing. Second, our R&D teams specialize in hardware and software integration. Third, and most importantly, our society values diversity and encourages an innovative spirit. Nevertheless, it is apparent that Taiwan now needs a clear strategy to retain its key positions in global industries and usher in a new "golden age" of technological progress. What I have proposed in the recent years is to pool our resources and focus them into niche fields that support a wide-range of industries. The thinking behind this approach, which is officially known as "Small Country, Smart Strategy," is to efficiently use the available resources to leverage for greater economic returns and create synergistic linkages across different industries.

Since I became the head of the Ministry of Science and Technology (MoST) nearly two years ago, my team and I have issued many policy directives and national-level projects for the proactive development of Taiwan's technology sector. We have also taken concrete actions to assist Taiwan's youth in getting involved with groundbreaking technologies such as AI, big data, IoT, network security, gene editing, the blockchain, etc. On the other hand, I believe that the complementary tasks of producing technological innovations and driving the upgrade of industries will require native talents as well as international assistance and expertise. Therefore, the ministry will allocate resources to create an environment that fosters entrepreneurship in the newly emerged industries.

The establishment of Taiwan Tech Arena (TTA) in June 2018 by MoST was the first step in the renewed branding of the domestic technology sector. Serving as a global center for startup development, TTA aims to elevate Taiwan's position to a leadership role in the international ecosystem for innovation. As the center cultivates international ties, it will gather resources at home and from overseas in the form of accelerators, incubators, and academic research projects. These valuable resources will be shared among startups that intend to set up shop in Taiwan. TTA will host various events to connect startups with local resources. Also, the center will send delegates to major international exhibitions, thereby providing opportunities for native startups to shine on the world stage.

TTA will be leading 44 homegrown startups to CES 2019 this January to demonstrate Taiwan's unique strength in transforming technological innovations into highly useful products and services. These elite teams will be showcasing their solutions in six application areas: IoT, network security, AI, healthcare, wearable techs, and advanced manufacturing. All of them have built up strong technological expertise, and eight of them will be receiving the CES 2019 Innovation Award. I personally hope that Taiwan's delegation to CES 2019 will not only find profitable opportunities but also bring about major changes for the good of mankind with their innovations.

Dr. Liang-Gee Chen

Minister, Ministry of Science and Technology, Taiwan

Liang-Gee Chen

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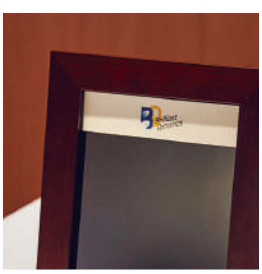

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INTEGRATION OF AI AND IOT TO BOOST SMART APPLICATIONS

Making Paves the Way for the Next Stage in Digital Transformation

IEK (Industrial Economics & Knowledge Center)

IEK is devoted to helping businesses in Taiwan meet revolutionary changes in a fast-moving knowledge economy. The Center aims to provide customers with value-added, multi-disciplinary information and services by using its ability to do in-depth research on industrial development. With its knowledge management and active interactions with the government and industries, the Center is expected to help the nation gain competitive advantages and assist the business community to create value.

The vision is to make AI ubiquitous and easy to use. The evolution of AI's role from perception and awareness to decision making paves the way for the next stage of AI development.

IEK expects an accelerating convergence of AI and IoT, into AIoT, and this will create a plethora of smart applications. As the key AI technologies progress, the industry is faced with a challenge in the choice of technology roadmaps and the identification of killer applications in digital transformation.

The majority of existing AI applications are on the cloud because only large computing centers can support the resources required for deep learning. However, the prevalence of AI will eventually shift to mobile and edge devices. The two technical hurdles for the architecture of edge computing are low power consumption chips and lightweight algorithms suitable for edge devices. The global semiconductor industry has been focusing on the development of low power consumption chips for some time. Various solutions have been put in place, each with its own scenarios, pros and cons. Created for edge devices, lightweight algorithms are the streamlined versions of massive algorithms via compression technology. International tech giants and start-ups are all developing the techniques and services required.

AI has come a long way in terms of recognition and perception. The end game is to make AI able to think like humans. This means faster learning, less data input, the ability to solve more complex decision-making problems, and autonomous learning of the required skills. Democratization of AI is also a key focus for the next stage, to bring AI to more individuals and companies.

IEK expects AI to gradually mature and penetrate all industries. The fundamental revolution in the bottom layer of AI will enhance its intelligence and capability and help us to solve different kinds of problems. In the development of various AI applications everywhere, companies in Taiwan should also stay on top of AI transformations. Every wave of changes in AI technology promises to bring significant improvements to a firm's competitiveness.

IEK has identified three trends in smart home. First of all, Amazon's Echo emerged in 2015 as a disruptive force with its AI-powered voice assistant reigniting the global market for smart homes. In the second half of 2017, the market for smart speakers entered an explosive growth period. Second, the value chain for AI-enabled voice services continues to take shape in both English-speaking and Chinese-speaking regions. Third, the battle for home robots has started, and this is shifting the competitive landscape for leading players in the smart home sector. Tablet makers, white goods manufacturers, surveillance device/service suppliers, mobile service operators and automobile companies are all entering the domestic robot market by focusing on family care and automated control.

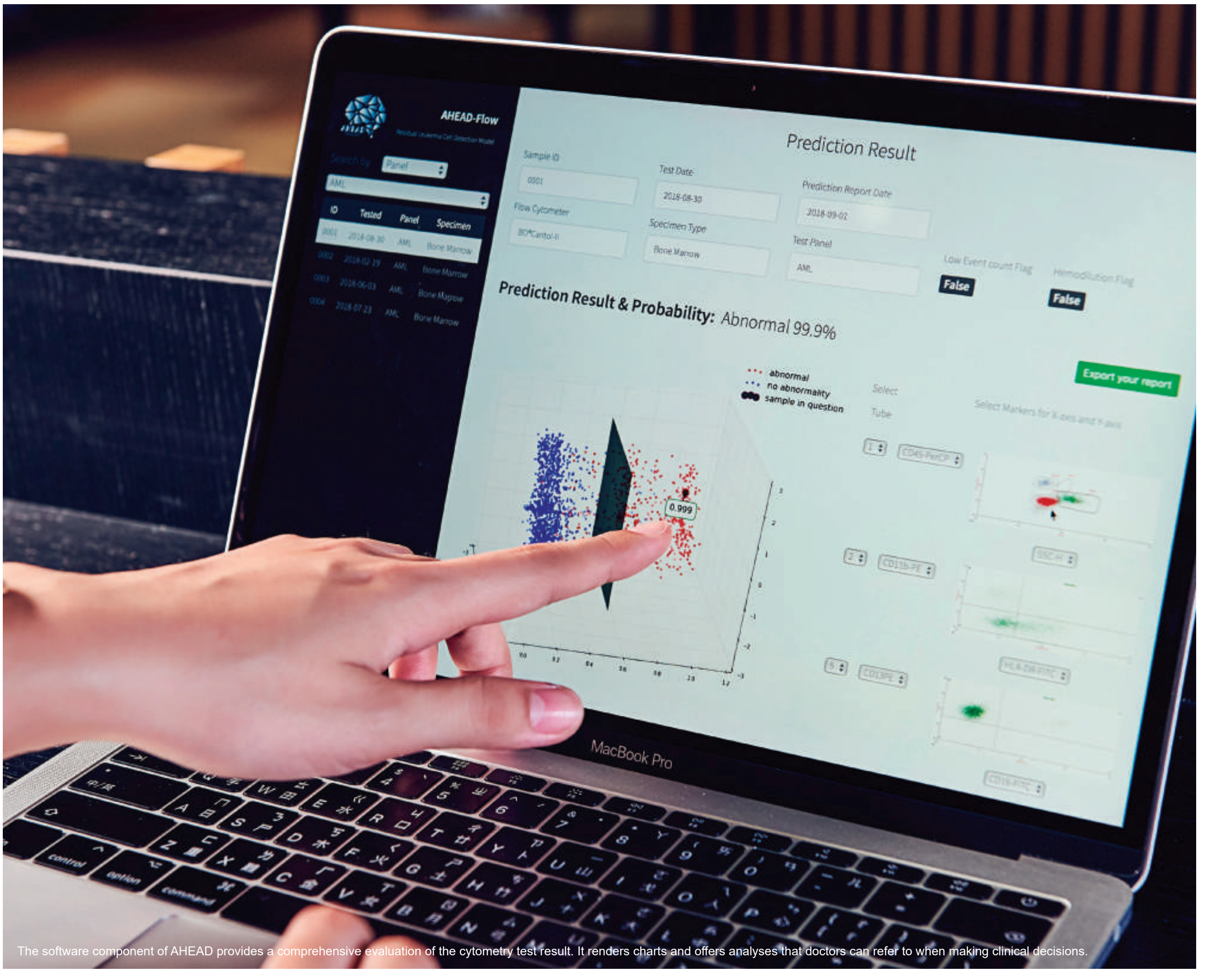
AI-powered commerce is expanding, driven by AI and IoT. This will open up the demand for a variety of AIoT hardware and software solutions, such as delivery drones, driverless taxis, unmanned stores, facial recognition payments, smart signage, smart dining tables, smart shelves, comforting or social robots, business support robots, warehousing and logistics robots and cargo inspection robots. AI algorithms and the platform serve as the brain of AIoT, are critical to the smooth operation of the whole eco-system.

IEK believes that AI-enabled service robot systems and platforms will develop in the following seven directions: cobots, voice assistants, machine vision, mobility platforms, applications centered on users' demands, self-learning algorithms, and open hardware/software architecture for robots. AI is also driving the transformation in different areas, such as smart workflows, products and services. The concept of the Digital Twin is shaping up as a result of the convergence of AI, AR, IoT and PaaS.

Going forward, AI application platforms, AI algorithms and AI sensors will essentially become one. Companies in Taiwan may respond by centering on AI application systems, platforms and architectures in order to get a grip of relevant AI algorithms. Taiwanese players may seek to make inroads by utilizing their advantage in the components for AIoT edge devices and IoT equipment (such as sensor chips, optical modules, touch panels and gateways). Any enhancement in the functionality of key components will assist Taiwanese companies in the development of software modules and integration with hardware solutions. The offering of high value-added components for AIoT machines could be a way to boost Taiwan's competitiveness in AIoT among Taiwanese players.

AI-ASSISTED BLOOD TESTING TOOL

Developed by Taiwan's Top Universities, AHEAD Detects Leukemia Cells with High Accuracy and Astounding Speed



The software component of AHEAD provides a comprehensive evaluation of the cytometry test result. It renders charts and offers analyses that doctors can refer to when making clinical decisions.

PROFILE

The AI-assisted blood testing tool was jointly developed by NTUH (National Taiwan University Hospital) and NTHU (National Tsinghua University). The Division of Hematology-Oncology and the Bone Marrow Unit at NTUH established the blood testing method, while the Department of Electrical Engineering at NTHU focused on creating the AI algorithm.

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http://biic.ee.nthu.edu.tw/ahead/

The US Food and Drug Administration has cleared 12 healthcare algorithms alone this year. The approved AI software products include a solution that analyzes data from iris scanning to support diabetes treatment decisions and a solution that helps doctors to detect signs of stroke in patients from computer tomography scans. As artificial intelligence (AI) and machine learning technologies steadily improve, the cases of their application in the healthcare and biotechnology sector will continue to increase significantly.

Among the countries that are engaging in the development of AI solutions for healthcare, Taiwan is expected to be a major driver of progress and inject a heavy dose of innovation into this market. Already recognized for having a medical system of a high standard, Taiwan has also nurtured a great number of talents in computer science within its academic institutions. Next year, a team from the startup hub Taiwan Tech Arena (TTA) will attend the Consumer Electronics Show (CES) to present AHEAD, a cutting-edge blood testing tool. AHEAD, which stands for "AI-Assisted Hematologic Analytic and Decision Support," is one of the best examples of cross-sector synergy between AI and medicine.

AHEAD provides AI-assisted analysis on blood samples of leukemia patients to help doctors to make a prognosis in their treatment (i.e. whether the patient will survive the treatment and the chances of the cancer returning). The two main components of this solution are the blood testing method and the AI algorithm. The blood testing method was developed by the Division of Hematology-Oncology and the Bone Marrow Transplantation Unit at National Taiwan University Hospital (NTUH), while the Department of Electrical Engineering at National Tsinghua University (NTHU) created the AI algorithm.

When It Comes to Processing the Biological Data Stored in Human Blood, the New AI-Assisted Testing is 200 Times as Fast as the Conventional Method

NTUH has already been developing technologies related to bone marrow transplantation for 30 to 40 years. Thus, the institution has built up a centralized transplant registry and accumulated a vast trove of important clinical data. The largest stem cell therapy center in Taiwan – the Tai Cheng Stem Cell Therapy Center – was established at the hospital in 2010. Equipped with plenty of expertise and resources, NTUH is certainly at the forefront of inventing blood testing tools of the next generation.

In the recent decades, flow cytometry has emerged as the technique that is widely used to examine blood cells for the diagnosis of leukemia. It is also used to evaluate the effectiveness of cancer treatments and assist in post-treatment prognosis. During a flow cytometry test, the testing equipment produces large quantities of complex data that require doctors and lab technicians to manually sift through and interpret. This problem of

Andrea Wang

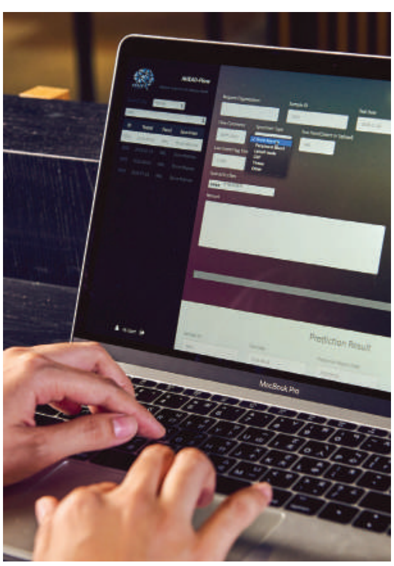
Yu-Fen (Andrea) Wang, who previously managed special research projects under Dr. Tang, is the founding member of the AHEAD team. She is responsible for the team's operation and resource integration.

organizing and analyzing data presents an opportunity for the application of AI.

Dr. Jih-Luh Tang, who is the attending physician for hematology at NTUH and a member of the AHEAD team, said that even an experienced specialist will need 20 to 30 minutes to fully examine and interpret the result from a flow cytometry test (i.e. to determine if there are residual amounts of cancer cells in blood and bone marrow). Dr. Tang also pointed out that human error could affect the test results and lead to a misinterpretation. For example, the testing equipment, which uses a laser beam to reveal the characteristics of a blood cell, may not be able to detect cancer cells if the testing sample has been labeled with the wrong fluorescence markers.

Yu-Fen (Andrea) Wang, who had previously managed special research projects under Dr. Tang and later founded the AHEAD project, said that the idea of using AI to expedite the blood testing process originated two years ago at an academic conference. During the conference, she met Chi-Chun (Jeremy) Lee, an associate professor of electrical engineering at NTHU.

Blood can be seen as a big database that stores all kinds of health information.



Human logic and experience can improve the ability of an AI system in making predictions.

Therefore, the application of AI to help doctors to organize and analyze the biological data contained in a drop of human blood is entirely appropriate. Dr. Tang explained that the sample set for a flow cytometry test consists of six test tubes, each containing 100,000-1,000,000 blood cells. Each tube is for detecting a specific biological marker of a cell. Thus, the cross-validation process for a sample set will generate a huge amount of data that a doctor will need at least 30 minutes to fully analyze. The accuracy and speed of the analysis correlates to the doctor's level of experience. So, a veteran specialist can more accurately interpret the test result in a shorter timeframe. What AI brings to this particular task is a greater degree of automation along with a significant improvement in speed and accuracy. According to the AHEAD team, the AI-assisted interpretation of a test result takes just seven seconds to complete.

The AHEAD project was established just recently in March 2017, and the development team spent about a year and a half to devise their entire system and make it technologically mature. A successful clinical trial is all that remains to take this innovation to the market. The team believes that even doctors who are unfamiliar with AI-based technologies can use the system intuitively. Andrea Wang stated that most AI-assisted tools that are currently on the healthcare market mainly facilitate the visualization of biological data. They do not actually help doctors to analyze the data more efficiently and accurately. AHEAD, by comparison, is a total solution package because its software can provide comprehensive evaluation. Besides displaying data in charts, the tool also offers its own analyses that doctors can refer to when making prognosis.

AHEAD has a very straightforward user interface. Once the data from the flow cytometry test are fed into the system, it will be converted into a series of highly readable charts that doctors can use to match the samples with their test tubes and check the samples for abnormalities. Even doctors who lack experience in interpreting test results can quickly understand the gist of the charts and make the correct assessments based on the available information.

Technical Talents and Regulatory Support Are All Needed to Widen the Full Deployment of AI in Laboratory Testing

Dr. Bor-Sheng Ko, a colleague of Dr. Tang and a member of the AHEAD team, said that blood testing is just the starting point in the application of AI for the treatment of leukemia. Dr. Ko noted that his hospital holds large and diverse data sets concerning diagnosis and treatment of blood cancers, including bone marrow biopsy samples (30,000 slides), cell images, and decades of information. These data sets, together with treatment records, can be used to train the AI system. The hope is that in the future when a patient reached a certain stage in the treatment, an AI-based model can be used to predict the patient's survival rate, the outcome of the surgery, and the chances of cancer returning. This kind of technology can help oncologists to adjust their treatment plans so as to actively respond to the developments in their patients' conditions.

There are still some serious challenges to the application of AI algorithms in the making of clinical decisions. IBM's Watson, for instance, failed in its trial runs at major cancer treatment centers in the US. The specific product, Watson for Oncology, garnered a lot of negative publicity for making errors in diagnosis and for the incorporation of fabricated patient data during its development phase. Reflecting on this example, Dr. Ko explained that the main problem was Watson's attempt to take decision making away from doctors. AHEAD, by contrast, is designed to assist physicians rather than replacing them. Dr. Ko further pointed out that today's AI software has yet to acquire a strong capability to learn by drawing inferences from data, which cannot completely substitute medical experts. On the other hand, the integration of human logic and experience can improve the ability of an AI system in making predictions.

Among the innovative industry sectors in Taiwan, the healthcare and biotechnology sector has the strongest potential to establish a major global presence. Andrea Wang noted that the digitization of medical records in Taiwan began very early. These digital data are now a form of precious resource that domestic biotechnology enterprises can use to develop products and services. Wang, however, also pointed out that having the necessary resource is one thing; finding talents that can edit and organize the medical data in ways that can be fed into AI systems is another.


The development team behind this innovative solution is composed of researchers from NTUH and NTHU.

Medical privacy regulations represent another major hurdle that stifles the adoption of innovative technologies such as AI algorithms, though Taiwan is not alone in this respect. Since AHEAD was developed in accordance with the existing regulations, it can only be used inside NTUH. Nevertheless, the development team has received inquiries from many hospitals. Most doctors who have heard about AHEAD have expressed hope that the system will soon become widely available because this technology can significantly reduce the time needed for interpreting the result of a flow cytometry test. The time and effort saved by the technology can be redirected to the actual care of patients as well. The University of Pittsburgh Medical Center (UPMC) has recently agreed to evaluate the AHEAD software, checking to see if it can perform just as well in the US as in Taiwan. The trial at UPMC represents a major step forward for the whole project.

The Growth of 5G Network and Cloud Computing will Help Realize the Provision of Advanced Medicine in Remote Areas

There is a strong possibility that AHEAD will soon enter commercialization. Dr. Tang said that if the system's software is proven to be successful in the clinical treatment of a complicated disease like leukemia, then it could be used in the testing of different forms of cancers and other kinds of diseases. Besides advances in machine learning, the 5G mobile network and clouding computing services also have to reach a higher level of maturity so as to allow AI systems to operate smoothly and handle the massive flows of digital data. Ultimately, AHEAD and similar solutions are expected to help doctors to care for patients wherever they are (e.g. in rural communities and far-off medical centers). With patients' basic information being uploaded to the cloud, the attending physicians theoretically will be able to remotely conduct diagnosis, treatment, and consultation.

The adoption of AI-enabled healthcare solutions is expected to spread beyond the developed countries. Dr. Ko mentioned that most general hospitals can afford to purchase flow cytometry equipment, but not many of them can find doctors who are proficient in interpreting flow cytometry data. Hence, remote and non-urban areas represent a potential market for AHEAD, along with the main metropolitan areas. Apart from its potential contribution to telehealth, AHEAD may be one of the key solutions to the problem of uneven geographical distribution of healthcare resources.

With respect to the challenges that the project faces, Dr. Tang stated that the most difficult challenge is to make the AI system practical for clinical use. On this specific issue, the accuracy of the medical data is extremely important. Dr. Tang said that AI of the future should be able to interpret raw data instead of analyzing data that have already been sorted manually by humans. In the case of AI-assisted medical image analysis, the direction of development is to have the AI system be able to directly analyze the inputted images. To achieve this, the overall quality of medical data has to be enhanced as well.

Jeremy Lee, who works on the AHEAD software, said that finding talents is the biggest challenge to the development of AI algorithms for healthcare applications. In the collaboration between NTUH and NTHU, the former focuses on the algorithm, while the latter provides the big data. In Lee's view, having software knowledge is essential in generating value from data. Currently, there are very few people that have the interdisciplinary expertise to integrate the hardware with the software to create new value-added services. Lee also stated the effective promotion of AI solutions in Taiwan will depend on a paradigm shift, where industry talents change their focus from reducing cost to creating value.

THE USE OF AI IN MULTI-TALKER SPEECH SEPARATION

RelaJet Enables Hard of Hearing People to Hear Clearly Again

The software component of AHEAD provides a comprehensive evaluation of the cytometry test result. It renders charts and offers analyses that doctors can refer to when making clinical decisions.

PROFILE

RelaJet aims to employ "the multi-talker speech separation" to enhance the listening experience for hard of hearing people. RelaJet solves the classic problem of Cocktail Party with its neural network engine to deliver accurate voice application in multi-speaker scenario.

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https://www.relajet.com/

Hard of hearing people face two main problems. Firstly, hearing aids are expensive. Take the top six global brands for example: their average price is about $2000, while high-end pieces could cost as much as $5000. Secondly, many conventional hearing aids are not effective enough because they are susceptible to interference from ambient noise. Blue Chen, a hard of hearing person himself, has gathered an AI algorithms team to found RelaJet. He aims to employ “the multi-talker speech separation” to enhance the listening experience for hard of hearing people.

Voice Recognition Eigenvalues, Hard of Hearing People Zeroing in on a Particular Voice

Any problem in the auditory hierarchy, from sound reception in the human ear to obtaining meaningful interpretation in the brain, can be regarded as hearing impairment. Hearing aids usually pick up background noise making it difficult for hard of hearing people to monitor the primary sound. On the other hand, the normal human auditory system can focus on the primary sound automatically filtering out background noise and other irrelevant conversations. For instance, at a noisy party, a normal person cannot only pay attention to the speech of nearby friends, but hear someone hollering at a distance. As long as one concentrates on the primary sound, the ambient noise would feel three times less loud. This process is termed the “cocktail party effect.” Overall, RelaJet aims to assist hard of hearing people to improve their detection, discrimination and identification in the auditory hierarchy.

To enable a hard of hearing person to better concentrate on the primary sound, one must first find the special characteristics. Through RelaJet’s neural network engine, and utilizing deep learning, one can complete multi-talker speech separation within 10 milliseconds. There are two main ways to achieve this objective. The first approach involves “pre-recorded sound eigenvalues.” Suppose Jimmy needs to converse with Ellen in a noisy room, Jimmy could first ask Ellen to record 2 to 3 seconds of her voice in his cell phone app. After the multi-talker speech separation has noted the eigenvalues of Ellen’s speech, the associated microphone would henceforth strengthen her voice while minimizing the ambient noise. The second is the so-called “ABX blind listening test.” The cell phone app does not pre-specify the eigenvalues of anybody’s speech. Instead, the multi-talker speech separation would instantaneously determine how many people are speaking, and then the user would select the eigenvalues of the desired speaking partner’s sound. The multi-talker speech separation will strengthen the desired sound while eliminating background noise.

Empathy for the Hard of Hearing People Foster Innovation under the Most Trying Circumstances

Both sound input and output are encoded via pulse-code modulation

Blue Chen

As the co-founder of RelaJet and also a hard of hearing person, Blue Chen could provide valuable feedback to accelerate RelaJet’s R & D process.

Various steps of the auditory hierarchy	
Detection	to receive the audio signal
Discrimination	to determine if the two sounds are identical
Identification	to identify the characteristics, properties or classification of sounds
Comprehension	to conduct meaningful interpretation of the audio signal

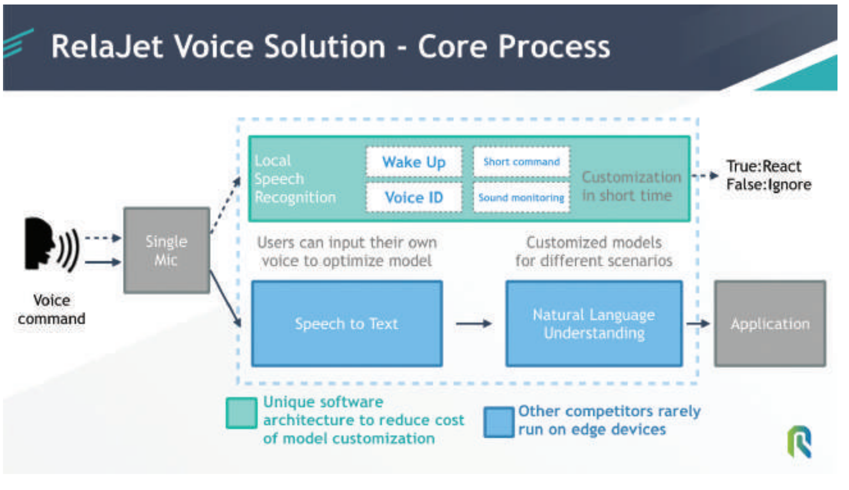
(PCM), completing discrimination and identification of distinct eigenvalues within 10 milliseconds represents multi-talker speak separation's greatest advantage. Why 10 milliseconds? That is because if hearing aids complete voice processing beyond this limit, the human ear will sense this delay causing dizziness. Hence, for a hearing aid to be classified as a medical device, it must finish all speech processing within just 10 milliseconds.

Chen points to his own hearing aids and says, "I have been lucky. A hearing aid piece costs around $4,500 each—meaning $9,000 for both ears. Although I can afford hearing aids, I still could not match normal people's hearing and pronunciation, much less those who could not afford hearing aids." Helping less fortunate patients has been the overarching motivation for the founding of RelaJet. As such, Chen demands that his products undergo the same rigorous medical worthiness review as other medical devices on the market. As a first step, he will introduce this technology to the top six global makers of hearing aids. Chen believes that if he could gain enough market share in the healthcare industry, then branching into the markets for Bluetooth headsets, smart speakers and other products with lower consumer demand would become easier.

Closely Monitoring Policy and Market Shifts, Using Technology Licensing to Gain Market Share

When asked why he resigned from his job at MediaTek to become an entrepreneur at this time, Chen states that he anticipates a seismic shift in the US hearing aid market. In 2020, the US Food and Drug Administration (FDA) will legally allow Over-the-Counter (OTC) hearing aids to come on the market. Future hearing aids will no longer undergo the time-consuming process to obtain medical certification. In the future, an AI algorithm can be used to certify hearing aids, significantly reducing the cost of these devices and making them more widely available.

Besides the current FDA-certified hearing aids, Personal Sound Amplification Products (PSAPs) are currently in the market. PSAPs resemble hearing aids in function and appearance; however, PSAPs are not classified as medical devices. These cheaper devices are designed mostly for mildly hard of hearing patients. Several consumer electronics brands such as Samsung, SONY and BOSE have already introduced Bluetooth headsets with PSAP functions. On the other hand, Apple's AirPod has enhanced its PSAP features via its voice assistant in its iOS 12. They are regarded as the current industry leaders in PSAP and are poised to enter the OTC hearing aid market. RelaJet has already begun to discuss



The normal human auditory system can focus on the primary sound automatically filtering out background noise and other irrelevant conversations.

with these companies regarding potential cooperation in OTC hearing aids.

At the same time, RelaJet has continued to be in contact with the world's six major hearing aid manufacturers. In the near future, consumer electronic device makers and these traditional hearing aid companies will be competing for market share in OTC hearing aids. RelaJet intends to make its multi-talker speech separation a very prominent feature of OTC hearing aids.

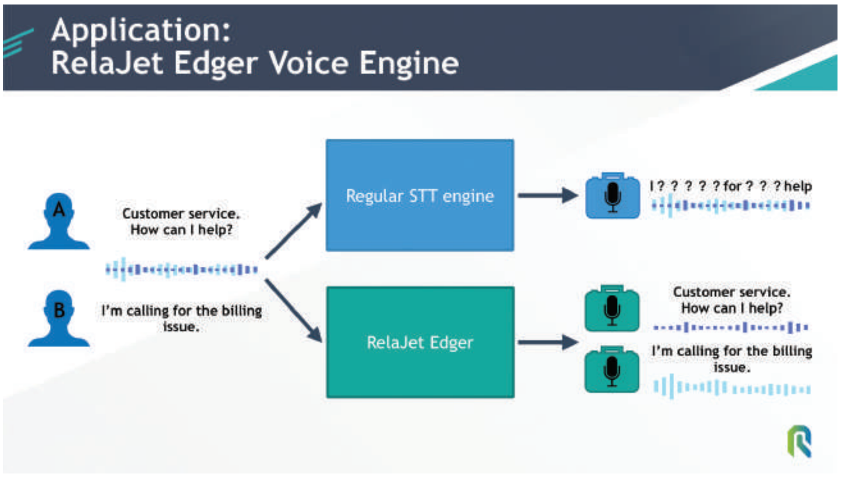
Chen has said that besides PSAP and non-prescription hearing aids, multi-talker speech separation can be implemented in many other devices in the future, namely, smart speakers and automotive systems. RelaJet mainly deals with the front-end analysis of speech recognition to achieve “Voice as a Service.” RelaJet’s business model would resemble that of Dolby, which licenses its technologies to consumer electronics manufacturers.

A Timetable for Product Launch, Participating in CES to Gain Publicity in the US and the EU

RelaJet, founded in March of 2018, has partnered with an American audio processing chipmaker. Moreover, if manufacturers need to use their technology, they also offer NRE (Non-recurring engineering, a one-time engineering costs) and other technology licensing services. Presently, RelaJet focuses on the medical device and headphone markets with PSAP features. Notably their other customer products have entered the design stage. RelaJet's short-term goals are to have marketable products containing their technology in the first quarter of 2019 and all OTC hearing aids incorporating their voice recognition technology by 2020.

The medium-term goal is to integrate the global audio database. AI algorithms must adapt accordingly to different languages. The six major hearing aid makers have cornered 95% of the market in the US and the EU; therefore, RelaJet will first focus on these two major markets. With the FDA lifting the ban on OTC hearing aids, RelaJet intends to license multiple-talker speech separation to the six major hearing aid manufacturers in 2020.

Lastly, RelaJet intends to attend the upcoming CES 2019 with the Taiwan Tech Arena led team. In this way, Chen hopes to establish a more strategic partnership with American hearing aid makers and Silicon Valley voice recognition developers.



HOW MUCH DO YOU KNOW ABOUT BREATHING?

Genius Holdings' Smart Breathing Tracker ezOxygen Helps You Prevent Lung Ailments

Genius Holdings' employees come from various medical backgrounds including drug development, medical equipment, nursing, and medical laboratory science.

PROFILE

With the innovative ultrasound intensity technology providing over 10,000 flowrate sampling, ezOxygen connects air quality index and everyone's breath health data by smartphone app, which brings the best care for exercise and respiratory management.

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As high-tech products evolve towards more compact sizes and the technology of wearable devices becomes increasingly mature, people will start taking multiple biometric measurements such as heart rate, steps, and sleep. Diabetic patients record their blood oxygen levels and people with high blood pressure monitor their blood pressure. Have you ever thought of tracking your respiratory condition?

Taiwanese startup Genius Holdings has developed the smart breathing tracker ezOxygen that adopts their proprietary ultrasonic technology to provide medical-grade accuracy in a compact device. Launched in September 2018, in Taiwan and the US, the product has already won the CES 2019 Innovation Award under the category of Fitness, Sports, and Biotech, which features other winners including Garmin and Samsung for their smart wearable devices. Genius Holdings is definitely the pride of Taiwan with their ability to compete alongside international companies.

Why Should We Keep Track of Our Breathing?

Most of the wearable devices have focused on measuring heart rate and ignored the importance of respiratory monitoring, says Duncan Chen, founder and CEO of Genius Holdings. He compares breathing to a car's exhaust system. A car with a problematic exhaust pipe will not run smoothly, even with a high-performance engine. Our heart is like the engine of the car and the respiratory tract is its exhaust pipe. Therefore, breathing plays a key role in maintaining good health.

For people suffering from asthma, respiratory tract problems, or lung diseases, tracking and monitoring breathing regularly is very important because they need to take medications immediately when they sense something is wrong. ezOxygen also tracks the effect of their medications to prevent acute asthma or respiratory irritation.

In today's environment, as poor air quality constantly causes respiratory irritations, tracking breathing has become essential. Using the GPS function on a mobile phone, ezOxygen can track the PM2.5 level at the user's current location. As air quality deteriorates, the device will immediately remind the user to keep track of their breathing to ensure healthy breathing.

For athletes, understanding and increasing their lung capacity through tracking breathing help improve their performance. For example, using aerobic respiration in sports like marathons, swimming and yoga releases more energy, resulting in higher performance. However, the respiratory muscle gets tired. After exercising for a long time, the muscle will shift to anaerobic respiration, leading to a significant reduction in training and performance.

Breathing data is important in health records. This is why Apple has integrated support for the ezOxygen

Duncan Chen

Founder and CEO of Genius Holdings, Duncan Chen says breathing data is important for maintaining good health and that is why the ezOxygen app and its data have been integrated into Apple's Health Kit.

ezOxygen won CES 2019 Innovation Award.

app and its data within Apple's Health Kit. The integration suggests Apple has recognized the importance of breathing data in future medical records.

Patented Ultrasonic Technology Delivers Medical-grade Accuracy

Genius Holdings has not only targeted the niche segment of respiratory health in the wearable technology market but also adopted the exclusive patented technology in its breathing tracker.

More than 80% of respiratory trackers and pulmonary function testers measure expiratory flow rate using a turbine. When the user exhales, the device will calculate the flow rate based on the rotational speed and turbine time. However, due to inertia, the turbine will not stop rotating immediately after the user stops exhaling, resulting in low measurement accuracy, only to the second decimal place.

Instead of using turbines like other breathing trackers, ezOxygen utilizes ultrasonic technology. When the user exhales, the air travels inside the device and creates sound waves, which are received by a MEMS microphone at a velocity of more than 100,000 signals per second. The device then calculates the expiratory flow rate to the fourth decimal place, which is 1/10000th of one unit. This design not only solves the inertia problem seen in a turbine but also reduces the interference of environmental noises encountered by professional ultrasonic tracking systems.

In today's environment, as poor air quality constantly causes respiratory irritations, tracking breathing has become essential.

Genius Holdings obtained patents for this technology in Taiwan and the US with patent applications filed in Japan, China, and other countries.

"We have changed the methods for tracking breathing. Our product not only beats other medical-grade technologies but is also suitable for home use", says Duncan Chen. The company has invested three years and a considerable amount of money to develop ezOxygen.

Creating a Breathing Pattern Database and Facilitating Early Diagnosis of Lung Diseases with AI Analysis

Characterized by high accuracy, suitability for home use, mobile, and low cost, ezOxygen can continuously collect a large amount of breathing data and create a database of different respiratory problems using big data analytics. Besides standard breathing patterns

ezOxygen provides more accurate measurements than other respiratory trackers using ultrasonic technology.

based on gender, age, and height, the database also contains breathing patterns of patients with different lung diseases such as respiratory tract problems, asthma, chronic obstructive pulmonary diseases, pneumonia, and lung cancer.

The respiratory data recorded by the user can be compared to their historical records and matched with the data in the database using AI technology. In the future, the device will be able to provide diagnostic support, assist doctors with treatment, and recommend medications.

Genius Holdings is working with the Taipei Medical University to track the breathing of asthma patients before and after taking medications and the effect of the medications. In China where online medical consultation is permitted, some medical service providers have ordered ezOxygen and distributed it to their patients so they can send breathing data to doctors regularly. This enables the doctors to perform diagnosis and provide healthcare advice remotely.

Comprehensive Care for Consumers and Patients

The next step for Genius Holdings is to get FDA approval. ezOxygen is currently classified as a consumer electronics product but can be marketed as a medical-grade device after approval. Once the design, production, and manufacturing processes pass medical standards, the product can be used in medical applications and be eligible for healthcare subsidies provided by the government and insurance companies. Thus, widening the gap between ezOxygen and its competition.

Among the consumer electronics providers in the category of Fitness, Sports, and Biotech categories, Genius Holdings is one of the few companies that has developed breakthrough medical technologies and leveraged data analytics to make inroads into the medical market. This is because Genius Holdings' employees come from various medical backgrounds including drug development, pharmaceutical industry, medical equipment, nursing, and medical laboratory science, making it a smart medical solution provider backed by professional technologies and domain knowledge with hardware and software integration capabilities.

Genius Holdings aims to take ezOxygen to the global market. By exhibiting at CES 2019, they are seeking US distributors to help them promote breathing awareness – keeping track and taking care of one's health through monitoring respiratory conditions in addition to heart rate and steps.

TURNS PURE WATER INTO A POWERFUL DISINFECTANT

Sanitation Startup EleClean Receive Innovation Award at CES 2019 for the Eco-Friendly Technology

Developed by Taiwan's EleClean, the EleClean Disinfectant Spray requires only pure water to produce a safe and effective disinfectant solution.

PROFILE

EleClean is a spin-off from ITRI in 2017. EleClean Disinfectant Spray is the first product launched onto the market and it using nano-catalysis electrochemical technology manufactures disinfectant within 15 minutes. Water is the only reagent and directly transformed into ROS (Reactive Oxygen Species) that effectively destroy viruses and bacteria by oxidizing method.

https://www.facebook.com/ELECLEAN.COM.TW/

http://www.eleclean.com.tw/

How would you feel if there is a kind of disinfectant solution made of 100% pure water without any chemical additives? What if the same disinfectant is not only strong enough to kill most disease-causing microorganisms (e.g. enteroviruses, Staphylococcus aureus, and Pseudomonas aeruginosa) but is also so gentle that it does not cause skin irritation? What if everyday consumers can produce this disinfectant anytime and anywhere using a highly portable and eco-friendly device? Does a product like this sound too good to be true?

Well, such a product does exist. EleClean, a startup specializing in sanitization technologies, has created the EleClean Disinfectant Spray. It is a device that can self-manufacture a powerful disinfectant solution almost instantly and without the addition of standard cleaning chemicals that may cause skin problems (e.g. rash, inflammation, and other allergic reactions) and even cancers.

The EleClean Disinfectant Spray is designed to be compact (14.8 cm tall, 4.7 cm wide, and weighing 100 grams) so that it can be carried from one place to another. To operate, just add a small amount of water into the device and turn its power on. In 15 minutes, the water will be converted into reactive oxygen species (ROS) – an antimicrobial agent that not only kills common pathogens but at a removal rate of 99.99%. Once the spray has been applied to the target area, the sterilization effect can last up to 72 hours.

The principle behind ROS is the electrolysis of water ions that produce oxidizing agents such as hydroxyl radical, superoxide radical, and hydrogen peroxide. These substances are highly reactive and will destroy the protein structures of viruses and bacteria upon contact. After these oxidizing agents have attacked the biological targets and completed their chemical reactions, they will transform back into harmless water or oxygen molecules.

"By converting water into ROS, we have finally found the most effective and safest disinfection method," said Chien-Hung Chen, CEO of EleClean. Just 38 years old, Chen looks not much different from the youthful, energetic members of his team. The group photo of the startup team taken for this article also shows Chen in high spirit as his employees, not exactly fitting the mold of a typical corporate leader. However, his language and demeanor during the interview reflect his solid background in research as well as an aspect of his personality that is driven and dedicated. After all, the design and research behind the EleClean Disinfectant Spray is the culmination of six years of hard work.

The Needs of Disaster Relief Guided the R&D Efforts and Take the Design of The Equipment for On-Site Disinfection Back to the Source – Water

Before founding EleClean, Chen had worked at ITRI (Taiwan's Industrial Technology Research Institute) for 13

Chien-Hung Chen

Founder and CEO of EleClean, Chen had worked at ITRI (Taiwan's Industrial Technology Research Institute) for 13 years as a senior researcher focusing on water treatment technologies.
The design and research behind the EleClean Disinfectant Spray is the culmination of six years of hard work.

years as a senior researcher focusing on water treatment technologies. Chen played a major role in developing Q-Water, a highly acclaimed mobile water purification system, as well as other types of equipment for water treatment. By chance, Chen also had the opportunities to participate in several humanitarian missions through organizations such as the Red Cross. In his visits to the less developed areas that were affected by natural disasters, Chen gained a deep realization that some sanitation and water-related problems that disaster-stricken communities have experienced are even beyond the capabilities of water treatment specialists. "Besides the provision of drinking water and electricity, the process of environmental cleanup and the maintenance of hygiene are also major issues that disaster-relief organizations have to deal with," said Chen.

Infectious diseases tend to appear and spread quickly after a natural disaster due to the significant deterioration of the environment, and they are often the main cause of the sharp rise in the mortality rate within the disaster zone. Also, an area that has just been hit by a natural disaster is likely to suffer a shortage of resources. At the same time, the quantities of disinfection kits that medical teams and volunteer groups can bring with them are often very limited. How first responders can rapidly clean up the disaster zone with existing resources at hand while not causing secondary damages to the environment eventually became the key issue that consumed Chen's attention.

Most disinfectants on the market are either based on hypochlorous acid (i.e. bleaches) or alcohols. Although they are strong enough to kill most kinds of disease-causing microorganisms and inexpensive to mass produce, they can be dangerous to humans, animals, and the environment if misused. For instance, hypochlorous acid is unstable and can react with other acids to produce the poisonous chlorine gas. As for alcohol-based disinfectants, they may cause skin allergies for some people, and their efficacy against enteroviruses is rather weak. In addition to their shortcomings, these two chemical disinfectants are generally not readily available in disaster-stricken areas.

Given the potential dangers and impracticalities of chemical-based disinfectants, Chen decided to take the design of his new solution back to the basics, which is simply water. During the initial conception of his disinfectant manufacturing equipment, he hit upon the idea that the two elements of water–oxygen and hydrogen–can be rearranged to form ROS, thus solving the most critical problem of finding an effective disinfectant.

While the principle behind the conversion of water into ROS appeared simple enough, the actual construction of a device that performs this process was the real beginning of the challenge. The speed of electrolysis had to be calibrated carefully so that the solution in the device has the potency to destroy most pathogens but remains mild enough to avoid skin irritations. At the same time, there was the even bigger problem of scaling down the electrolysis component to the point where it can fit into a small spray bottle.

"It took around six to seven years to select the materials, design the electrolysis module, and build the whole product," said Chen. "In fact, our team just finished creating the first prototype last year. This shows that we have successfully entered a specialized field that has a very high technical barrier."

Widely Recognized for Being Safe and Environment-Friendly, the EleClean Disinfectant Spray Is Poised to Ride on The Global Demand for Green Technologies

The current model of the EleClean Disinfectant Spray is equipped with a set of nanoscale catalytic electrodes and comes with an activation crystal that is contained inside the spray bottle to facilitate the conversion process. To use the device, simply pour 20 milliliters of water into the spray bottle and press the power button on the side of the bottle. In 15 minutes, the water in the bottle will turn into a disinfectant solution that is odorless, tasteless, and non-irritable. Since the ROS is made from just water and will turn back into water after killing the pathogens via the oxidation process, it is totally non-toxic. The product has also passed a stringent skin test to ensure that it does not cause skin allergies and has no carcinogenic risks.

The EleClean Disinfectant Spray differentiates from the typical products that are on the market with its ability to instantly manufacture the disinfectant solution by itself with only water and electricity. At the same time, the device is highly portable and easy to use. By reducing health concerns related to chemical disinfectants and preservatives, the EleClean Disinfectant Spray represents a new option that is safe, effective, and environment-friendly.

Undoubtedly, "safe and environment-friendly" is the message that EleClean wants to present to the public. Chen often wonders why consumers are so intent on using poisonous and noxious substances to disinfect things. "The surface of an ordinary desk, for instance, actually contains just a small quantity of bacteria," said Chen. "And yet common disinfectant sprays and wipes for cleaning the desk surface are extremely harsh for their users."

Since the goal is to lower the concentration of disease-causing viruses and bacteria within the environment to a safe level for human health, chemical disinfectants are not always necessary and may be harmful in some cases. Infants, for example, could accidentally come in contact with chemical disinfectants and get seriously poisoned. Protecting young children from toxic substances, including those present in household cleaning products, is an idea that all parents can rally behind.And, because the EleClean team has done so

EleClean was founded less than two years ago. The average age of the entire team is under 35 years. After opening up the domestic market, the company plans to expand overseas in 2019.

much in advancing environment-friendly solutions, the National Taipei University of Technology has invited the company to promote the "Green Chemistry Program" on its campus this year. The program, which was initiated by the Toxic and Chemical Substance Bureau of Taiwan's Environmental Protection Agency, encourages students to pursue innovations that benefit both consumers and the environment.

The use of green technologies has become a global trend recently. Consumers in Taiwan have also shifted their preferences when it comes to purchasing household products. Previously, they tended to choose inexpensive and mass-manufactured goods with qualities and lifespans that are maintained by chemical additives. Now, however, they are increasingly demanding safer and more natural goods from vendors. This change in attitude is not only consistent with the global trend but also the result of hard-learned lessons, such as the food safety scandals that rocked Taiwan's society in the past several years.

Oxford Dictionaries has selected "toxic" as its international word of the year for 2018. Apart from being applicable to most of the major news events of the year (e.g. the poisoning of the ex-Russian spy in Britain, the air pollution crisis in India, and the worsening of political culture worldwide), the word "toxic" also reveals a reaction against the deterioration of the environment as well as a desire to live in a society that is healthier, less stressful, and more transparent in terms of knowledge and information. In this respect, EleClean's mission of balancing the quality of human life and the quality of the wider environment fits in with the public mood.

The Possibilities for Future Development are Endless as EleClean Explores Overseas Market Channels

Founded less than two years ago, this startup of just 15 people with an average age of less than 35 years has now entered into a partnership with Chunghwa Senior Care to open up sales channels in the domestic market. Chunghwa Senior Care is a subsidiary of Chunghwa Chemical Synthesis & Biotech, Taiwan's oldest manufacturer and wholesaler of drugs and pharmaceutical products. EleClean plans to enter the international market next year, and it has already made contact with Singapore's Ma Kuang Chinese Medicine and Research Center as well as with other major pharmaceutical companies in Mainland China and Japan. EleClean is also probing opportunities with a diverse range of businesses including cross-border e-commerce platforms and distributors.

EleClean will be exhibiting at this year's Consumer Electronics Show (CES 2019) in Las Vegas, Nevada, United States. The startup has been selected as a member of the delegation led by Taiwan Tech Arena, an incubator that is funded by the Ministry of Science and Technology. During the event, Chen and his team will be showcasing the EleClean Disinfectant Spray, which has won the CES Innovation Award in the home appliances category and paving the way for access to the US market.

"The possibilities of our technology are infinite," said Chen with high confidence when he was asked about the future development of his company. Currently, the EleClean Disinfectant Spray is the only device in existence that manufactures ROS disinfectant for household applications. Going forward, Chen and his team will also be devising other personal and household cleaning products. They may even scale up their technology so that it can support various industrial and commercial applications (e.g. disinfection and sterilization equipment for factories, care homes, livestock farms, and biotechnology research centers). According to its roadmap, EleClean intends to release one to two new products every year, thus providing safe, sustainable, and effective options for many types of cleaning tasks.

When asked about the support he has received during the pursuit of his venture, Chen said that he is extremely grateful for his family and investors for allowing him to take this journey of establishing a startup that develops a new technology to address the needs of remote or disaster-stricken areas. Chen is also thankful for ITRI and its former president Chintay Shih. As a spin-off from ITRI, the members of EleClean hope that their solutions will contribute to the society's sustainable and balanced development in the future.

BRILLIANT OPTRONICS' SMART FILM

Turns Glass into Smart Windows and Solves the Challenge Including Single-Function and High Cost from Glass Replacement

The two co-founders of Brilliant Optronics, Heng-Yi Tseng (left) and Cheng-Chang Li (right) are showing their smart film product.

PROFILE

Brilliant Optronics has recently developed a new type of smart film that can turn ordinary glass into smart windows. The multi-function smart film can be directly attached on the existing glass, the glass thus can be selected between transparency, privacy protection, window tint and image display.

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With the advancement of new technologies and the arrival of the IoT, a diverse range of smart home products have sprung up and are transforming our everyday lives. Brilliant Optronics, a tech startup based in southern Taiwan, is one of the major companies that have taken advantage of this trend. They have recently developed a new type of smart film that can turn ordinary glass panels into smart windows.

A Smart Film with a Brand New Structure Brings Profitable Business Model

Brilliant Optronics is a startup focusing on photonics, co-founded by Tsung-Hsien Lin, the Chairman of the Department of Photonics at NSYSU (National Sun Yat-sen University), and the two Ph.D. candidates Heng-Yi Tseng and Cheng-Chang Li. Their main specialties are the R&D, process integration, and production of smart windows. Their primary product, a smart film that is capable of adjusting light transmissions, has taken the university more than a decade to develop.

The lab team was originally devoted to the production of glass products but had later found that the market was too competitive. In the face of this competition, the team members had decided to focus on alternative projects, which eventually led to the creation of their smart film.

Unlike a typical smart film, which can only display a black or cloudy effect when charged with a current, Brilliant Optronics' smart film is capable of showing three different kinds of effects. When not charged with power, its surface is clear and transparent; when charged with power, its surface can either turn dark or cloudy, or become a black transparent screen for displaying images and videos.

Brilliant Optronics' smart film is constructed by placing a liquid crystal molecule film between two PET films. By controlling the voltage applied to the film that forces the liquid crystal molecules to change alignments, the film can exhibit the three contrastive effects mentioned earlier. Users can press a button, a Bluetooth or WiFi device, or app to activate the voltage control module that allows the film to switch between its different states.

The installation of the smart film is simple. To apply it, just adhere it to the surface of a window. The fact that there is no need to replace or install new windows saves a lot of costs and reduces risks, especially for commercial buildings or skyscrapers. Due to smart film's compatibility with different curvatures and sizes, it can be applied to all types of glass.

The price of the smart film, which is expected to target top-tier customers, will be around $350-450 per square meter. Its production costs are expected to be a lot lower than those of the existing smart windows and smart films, which makes it a good option for buyers.

Cheng-Chang Li

Co-founder and CEO of Brilliant Optronics, who is also a Ph. D. candidate in NSYSU. He and the team members have published over 80 SCI scientific papers including leading journals such as "Nature Communications," "Advanced Materials" and "ACS Photonics."

When charged with power, its surface of Brilliant Optronics' Smart Film can either turn dark or cloudy or become a screen for displaying images and videos.

Crossing the Gigantic Gap between Academics and Entrepreneurship

Although the Brilliant Optronics team has developed a promising smart film technology, the road toward its commercialization will be quite rough. According to Heng-Yi Tseng, all of Brilliant Optronics' members are from an R&D background and have very little idea about how to run a business.

The team members have come to realize the difficulty of transitioning from an academic to the business field after they joined the FITI program supported by the Ministry of Science and Technology (MOST) to undergo entrepreneurship training. Having completed the program, they are now planning to recruit marketing and sales talents to build a better team that can help their products gain more exposure.

Although their smart film has yet to hit the market, it has already attracted a lot of attention from various expos and startup competitions. Many potential investors are also showing interest in investing in the team. As of now, the team's main funding comes from the university, the team members' relatives and friends, and individual personal savings. Tseng says that their main goal, for now, is to improve their smart film technology's yield rate and production processes. After achieving a steady yield rate, the startup team will then begin to purchase equipment that can produce films on a larger scale. At present, Brilliant Optronics is already capable of producing 40-cm-wide films of any length. Their goal in the future is to establish a production line that could produce 1-meter-wide films.

To obtain the funding for building the production line, Brilliant Optronics will be looking for Angel investment in 2019 of around NT$ 15 million ($470,000). According to Tseng, National Sun Yat-sen University will be the main investor. The next steps for the company are to finish the Series A round funding in 2020 and to prepare for mass production and product marketing. Although they will be aiming for overseas markets, Tseng expects Brilliant Optronics' production line to remain in Taiwan.

Finding Strategic Investors and International Marketing Channels at CES 2019

There are two kinds of markets for selling smart films. One is the original equipment market, which sells glass or windows that are already installed with smart films; the other is the aftermarket that sells smart films independently. According to Tseng, Brilliant Optronics will be marketing their products to various construction companies in the original equipment market. In the aftermarket, they will work with dealers selling window films and will try to enter the automobile and construction segments. According to Tseng, the aftermarket would be Brilliant Optronics' first priority, as their smart film can be installed without tearing down any windows, which makes it an attractive option compared to some competing products. For the time being, Brilliant Optronics will focus on the B2B market instead of the B2C market.

Brilliant Optronics will be joining Taiwan Tech Arena (TTA) at CES 2019, with the hope of finding strategic investors, better material and equipment suppliers, and international marketing channels. They intend to target Europe and the US, the two major markets for smart windows. China, the largest market in Asia, is also on their radar.

With their unique smart film technology, it would be interesting to see if Brilliant Optronics can successfully penetrate the fiercely competitive smart window market all around the world.

$6.86B

The global market of smart glass and smart windows by 2022

90%

From the three leading industry: automotive, construction and aircraft

$470K

Brilliant Optronics will be looking for Angel investment in 2019

The Brilliant Optronics is now able to produce 40cm-wide films of any length. Their goal in the future is to establish a production line that could produce 1-meter-wide films, which can be used for commercial buildings and smart home scenario.

WATER QUALITY MONITORING IN FISHPONDS

Effectively Removing Aquatic Toxins to Make Aquaculture More Sustainable

Gintel's water monitors were geared toward aquaculture. In the future, the company hopes to apply the device to the monitoring of drinking water, river water, irrigation water and industrial wastewater.

PROFILE

Gintel Technology has designed a water quality monitoring system specifically for aquaculture to help aquaculturists better cope with potential adverse conditions to minimize economic losses.

They aim to produce a more practical water quality monitor that can measure over fifty variables useful to aquaculture and accurately determine the condition of an aquaponics.

http://www.td.kyu.edu.tw/gintel/main.htm

Aquaculture has been an important industry; however, most aquaculturists have limited control over the environment. Without the necessary preventive measures, sudden environmental changes leading to a significantly elevated level of aquatic toxic substances often result in massive fish die-offs.

Gintel Technology has designed a water quality monitoring system. Combining an advanced sensor and big data analytics, the information collected would be one of the most comprehensive dealing with aquafarming. The use of a 24-hour surveillance system, the data connection and cloud analytics can help aquaculturists better cope with potential adverse conditions, as well as reduce the need to unnecessarily administer chemical agents

At a previous meeting of the Asian Development Bank (ADB) held in Vietnam, Gintel Technology was invited to present its water monitoring system to the conference. Afterwards, a Vietnamese shrimp wholesaler decided to order over a thousand units following a six month trial of six such devices.

Solve the Problem of High Toxin Concentration from Small Aquaponics to Big Fishpond

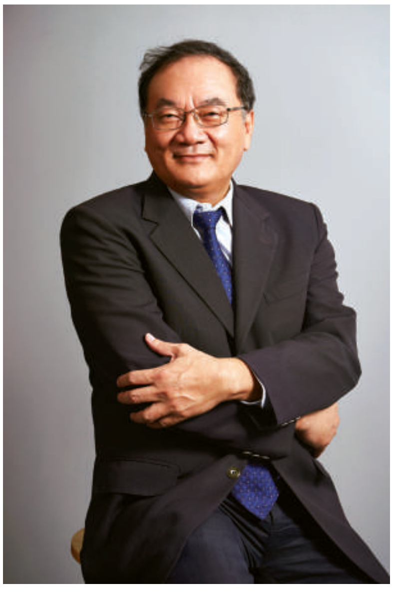
Gintel Technology founder and CEO Chin-Yuan Hsieh has a Ph.D. in aerospace and marine engineering. Dr. Hsieh has not only served as an information science faculty at a local university but has also won multiple awards as an inventor. Dr. Hsieh's foray into building a water monitoring system began a few years ago when Taiwan's Ministry of Education asked him to help solve the problem of high toxin concentration in aquaponics.

Aquaponics may seem to be a simple, stable system; but actually, its aquaculture and hydroponics components are constantly changing. When its hydroponic system cannot adequately absorb its aquacultural by-products, these excess organic matters (animal excretions and fish feeds) will produce chemical reactions to form aquatic toxins resulting in the eventual demise of fish and vegetation.

Dr. Hsieh aims to produce a fine water monitoring system to accurately determine the condition of aquaponics. Previously available tools could only measure water's pH values, temperature, salinity, total dissolved solids, dissolved oxygen and other basic parameters, but they could neither determine the levels of toxins in water nor where the likely problems originate.

The more useful parameters for measuring water quality are the concentration of the ammonium ions/nitrites which are correlated with the level of excretion and the number of Vibrio pathogens.

Hence, Dr. Hsieh has developed a more practical water quality monitor that can measure over fifty variables useful to



Chin-Yuan Hsieh

CEO Chin-Yuan Hsieh has a PhD in aerospace and marine engineering. While dealing with the rising toxin concentration in aquaponics, he came up with the idea of applying his past experience with big data to water quality management.

CEO Chin-Yuan Hsieh explains how data from water quality monitoring could be translated to a commercially viable product.

aquaculture. Besides the aforementioned parameters, the device can also measure the bacteria concentration (including E. coli), phosphates, cyanobacteria, phytoplankton, humic acids and the total ammoniacal nitrogen.

Rapidly identifying an elevated level of these harmful substances mentioned above, and properly deducing their causes will enable aquaculturists to improve water quality accordingly; i.e., one must reduce the concentration of toxic substances, increase the level of oxygen, adjust the water temperature, and change the water as necessary. Previously, when facing sudden mass fish deaths, aquaculturists would blindly administer chemicals and antibiotics without realizing the actual cause.

This water quality monitor comes with portable and fixed types. If one installs the fixed type in a fishpond, a real-time, constant monitoring together with the data connection and the cloud analytics would quickly warn against any abnormal rise in the concentration of toxins. Consequently, aquaculturists can finally sleep well at night without constantly worrying about a sudden, massive fish die-off. If aquafarming can become an attractive career choice, more young people may be willing to return to work in the countryside for living. Dr. Hsieh has often envisioned lively rural areas preserving the ecological balance with the assistance of Gintel's water quality monitoring system.

The Truth Behind Big Data Comes from Electromagnetic Radiation of Various Wavelengths

How does Dr. Hsieh and Gintel Technology dominate the world of water quality monitoring? How does its quality monitoring system measure more than fifty different water quality parameters? The basic principle takes advantage of the fact that different kinds of substances react with different wavelengths of radiation. Moreover, the concentration of the substance will be reflected in its radiation signal strength.

Therefore, through a probe dipped into water emitting electromagnetic radiation of various wavelengths (microwaves, radio waves, etc.), one can detect a variety of substances under the surface and their concentrations based on the reflected signals.

As for the usually encountered substances and their corresponding electromagnetic frequency, the exact association between the substance's concentration and its signal strength represent the cornerstone of water quality monitoring. To obtain the needed big data, one must conduct painstaking experiments. Fortunately, Dr. Hsieh formerly served on the editorial board of two international journals. As such, he has always had first-hand knowledge of the latest research results from institutions worldwide besides Gintel Technology's own findings, enabling Gintel Technology to produce such a superior water quality monitor capable of measuring numerous parameters.

Dr. Hsieh has thus expressed his gratitude for the contributions made by the various laboratories worldwide; without which this product would not have come to fruition. Gintel Technology has so far only applied its water quality monitor to aquaculture. The same principle can likewise be applied to monitoring the quality of drinking water, river water, irrigation water, industrial wastewater, etc. Overall, the possibilities for this system seem endless.

Exhibiting at CES 2019, Introducing Water Quality Monitors to the Global Aquaculture Industry

Based on its R&D, Gintel Technology has obtained grants totaling approximately $100,000 from Taiwan's Ministry of Education, Ministry of Economic

Gintel's water quality monitor system can measure over fifty variables useful to aquaculture, help aquaculturists better cope with potential adverse conditions to minimize economic losses.

Affairs and ITRI (Industrial Technology Research Institute) for developing its latest water quality monitor system. Dr. Hsieh also intends to seek the assistance of Taiwan's Council of Agriculture to promote his advanced product to Taiwan's aquaculture industry based on his familiarity with the needs of startups and aquafarming.

Recent climate change, the increased frequency of severe weather and the excessive use of chemicals in daily life may also adversely affect environmental water quality, affecting business as usual for Taiwan's aquaculture industry. Natural disasters can devastate the industry rapidly. A new approach with governmental assistance to ensure the survival of the industry has become even more crucial. Furthermore, the government should help start-ups complete the "Proof of Concept" stage, which helps materialize the product. Testing various scenarios often requires considerable expenses that usually only the related agencies of government can or is willing to provide.

Through CES participation, Gintel Technology intends to explore potential new markets in the United States, the European Union and Central/South America. Gintel Technolgy hopes to implement its water quality monitoring system in different aquaculture situations, thereby gathering more needed information to optimize the use of the system.

Different substances react with different wavelengths of radiation. Furthermore, the concentration of the substance will be reflected in its radiation signal strength. Dr. Hsieh has developed a real-time water quality monitor.

QT MEDICAL IMPROVES THE TREATMENT OF HEART DISEASE

With The World's Only FDA Approved Medical Grade Home Use 12-Lead ECG Monitor

QT Medical has combined cloud, big data, AI, and physicians' clinical judgment to enhance the subsequent machine learning and analysis.

PROFILE

QT Medical is a startup that will bring better care to millions of patients with heart disease. The arrival of QT ECG represents a breakthrough for a smart ECG monitor. It is currently the world's only FDA-certified medical equipment that enables patients to do the test at home.

https://www.facebook.com/qtmedical/
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http://www.qtmedical.com/index.html

Healthcare providers attach ten cold electrodes to an infant's delicate torso. As the examination proceeds, the infant's squirming and intense crying interfere with the electrocardiogram readings, thus delaying the diagnosis.

While cardiovascular diseases kill 60 million people annually, ECGs have not significantly changed

According to US statistics, approximately 1 out of every 2,000 babies is born with Long QT Syndrome (LQTS) resulting in 400 neonatal deaths a year. Without an adequate ECG, LQTS cannot be diagnosed in time to prevent sudden death. This grim scenario represents what Dr. Ruey-Kang Chang has had to face almost daily.

"A lack of a suitable electrocardiogram for infants has been frustrating. We usually have to modify available adult conductive pads to fit a baby's smaller size. Additionally, babies often do not cooperate with clinicians, making a good physical examination difficult," Dr. Chang says. Dr. Chang, who grew up in Taiwan, currently serves as a professor at the University of California, Los Angeles (UCLA) with 20 years of experience as a cardiologist. Notably, his experience as a student researcher in pediatrics and pediatric cardiology has cemented his determination to improve the ECG.

Dr. Chang often wonder why nobody has yet to improve upon something that obviously needs an upgrade. Seeing lives that eventually perished because they did not have better instruments has saddened Dr. Chang deeply. LQTS and other various cardiovascular diseases could all benefit from a better electrocardiogram. According to CDC, each year about 610,000 people die of heart diseases in the United States. In other words, one in every four American deaths is cardiovascular-related. The most dangerous aspects of heart diseases lie in their insidious nature and abrupt onset. Early detection has been a research focus for a long time, but progress has been limited.

One-Lead OTC Device Lacks Accuracy and Precision, but a 12-Lead ECG Must Overcome Challenges Ahead

Upon closer inspection of existing cardiac monitoring devices, one could quickly realize not much has changed in over 100 years. While there are wearable smart medical devices nowadays, electrocardiography progress has stayed relatively stagnant. Take Apple Watch series 4 for example; although it provides long-term monitoring of chronic heart conditions and heart rate, it is still considered an OTC electrocardiogram. The information obtained is not regarded as an ECG in the traditional sense, but an electromagnetic pulse within a specified period. Furthermore, whereas the traditional ECG has twelve leads, Apple Watch contains only one lead to screen only for cardiac arrhythmias.

Dr. Chang indicates that if one equates using a one lead ECG to installing a

Ruey-Kang Chang

QT Medical founder/UCLA professor Dr. Ruey-Kang Chang has been a practicing cardiologist for approximately 20 years and possesses over 15 patents. He launched two startups to improve upon the 12 Lead ECG monitor for pediatric cardiology.

ECG QT converts the conventional ten electrodes to one simple pad. Not only can it reduce errors due to pad misalignment, but the patient can also choose the appropriate pad size (S-XL) for their body. A small wearable medical grade ECG device about the size of a deck of cards can be easily placed in a pocket. All the ECG data can now be obtainable to patients in the comfort of their own home.

security camera at home, then employing the 12 lead ECG would be like putting cameras in every corner of the room. Notably, only a 12 lead ECG, not its one lead counterpart; can detect myocardial ischemia, heart attack, cardiomyopathy, myocarditis, pericardial tamponade, etc. Hence, a medical grade home use 12 lead ECG data will prove vital for timely detection of heart diseases.

A wearable, smart 12-lead ECG monitor will still need to clear major obstacles before it can become mainstream. On the one hand, medical grade devices often involve a relatively long time of detection; on the other hand, the enormous amounts of time spent and high expenses of R&D usually make them less price competitive, and thus harder to gain market share. The greatest hurdle for any potential new marketable medical device has always been getting FDA approval. A new medical product must properly address the issues concerning safety, durability and warranty. All the above-mentioned factors have contributed to the relatively slow development of medical grade devices in general.

The World's Only FDA Approved Home Use 12-lead ECG, Writing a New Chapter for Treating Heart Diseases

The arrival of QT ECG represents a new breakthrough for a smart ECG monitor. The five-year-old QT Medical will launch a wearable ECG, the size of a deck of cards, during the first quarter of 2019. It is currently the world's only FDA-certified medical equipment (K180157 T-FDA)—medical grade, home use 12 lead ECG.

QT ECG transforms traditional ECG's ten conductive pads into a simple pad with a size range (S-XL). A patient can connect the device to a smartphone or a tablet at home without the assistance of health professionals. All the important ECG data that are usually only obtainable in a healthcare setting can now be available to patients in the comfort of their own home. Cardiologists can also access the real-time ECG results and offer their interpretation online. Without the inconvenience of getting an ECG only through a medical facility, both patients and healthcare workers can access this vital information in a timely, accurate and convenient manner. "Overall, we hope to bring the home use 12-lead ECG to all the locations and situations that need one," said Dr. Chang.

After tackling problems associated with the conventional ECG, QT Medical has combined cloud, big data, AI, and physicians' clinical judgment to enhance the subsequent machine learning and analysis. Hopefully, in the future, AI and the high predictive power of an ECG can assist physicians in their clinical management of patients.

With QT ECG, Attending CES 2019 to Gain More Exposure

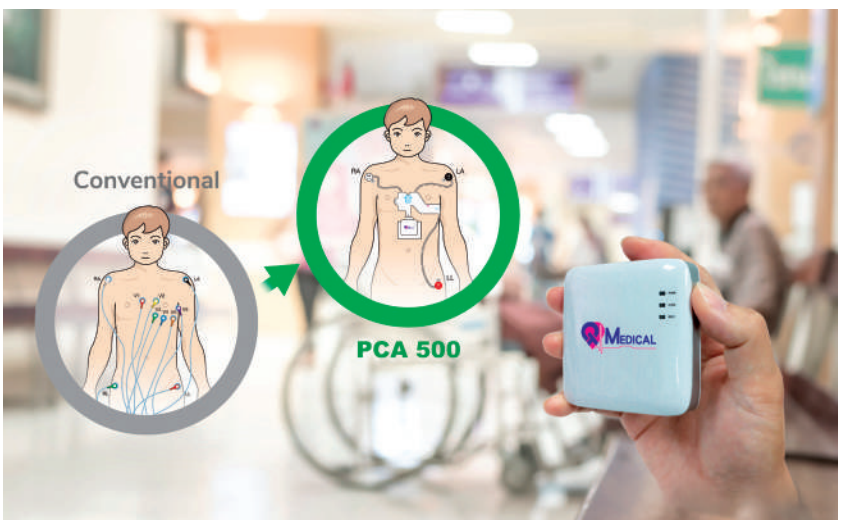
To gain market share in the multi-hundred billion dollar global

QT Medical presents the QT ECG, which allows patients to learn to use a medical grade product from a user's manual without professional assistance. Moreover, through a smartphone/tablet, test results can be uploaded to cloud storage enabling a clinician to offer a timely diagnosis online, which solves the inconvenience and realizes the promise of telemedicine.

cardiovascular disease market, QT Medial has contacted the medical establishment regarding potential cooperation. Their accurate clinical data has garnered attention form clinical research institutions and pharmaceutical manufacturers' Contract Research Organization (CRO) for possible use in evaluating cardiac safety of new medications to prevent drug-induced arrhythmias and sudden death. The upcoming exhibit at CES will represent QT Medical's first step toward gaining widespread attention. Ultimately, Dr. Chang's overriding aim is to deliver the device to patients directly. In doing so, QT Medical has stayed true to their motto of providing comprehensive cardiac care to all people all the time.

Due to their unrelenting desire to develop a user-friendly cardiac monitor, Dr. Chang and former University of California, Irvine (UCI) Professor Pai Chou started working on a prototype eight years ago, and then jointly founded QT Medical 5 years ago in the United States. The company is now twenty-members strong with branches in both United States and Taiwan. The US team primarily focuses on clinical testing, while the Taiwanese team conducts technological research. Their team members include ex-MediaTek signal engineers, cloud engineers, cloud analysts, and researchers from the Department of Biomedical Engineering at National Yang-Ming University (Taiwan). QT Medical founder Dr. Chang has modestly pointed out that compared to most other US medical device startups, his team does not have the most prominent medical background. They nevertheless are all willing to relentlessly pursue their common ideal.

Next year, QT Medical plans to seek FDA approval for their pediatric medical devices and to widely promote newborn screening. The company intends to significantly reduce the number of sudden neonatal deaths—the main purpose of their business plan. Undoubtedly, we have arrived at a turning point for ECG development. The history of mankind's struggle against heart diseases will be rewritten, and a new chapter for smart medical devices will be born.



QT ECG transforms traditional ECG's ten conductive pads into a simple pad with a size range (S-XL).

STOP CARRYING MULTIPLE ADAPTERS FOR USB-C LAPTOPS

SIMPower's Hyport Will Take Care of All Your Needs with Its Integrated, All-in-One Design

Hyport can supply AC power, charge mobile devices and transmit signal or data at the same time.

PROFILE

USB-C interface reduces familiar ports to consumers. On the contrary, the users need to bring more peripherals for USB-C devices. In order to solve the inconvenience, SIMpower develops Hyport, which combines adapter, USB charger, HDMI, Dongle and wireless charging pad in it. Let the consumers only carry the necessary to support all functions.

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http://www.simpower.com.tw/en/index.php

Compared to traditional laptops, USB-C laptops are typically more attractive and portable, thanks to their slimmer design. However, they can also be quite inconvenient and annoying. As mainstream USB-C laptops only come with a single port like MacBook, a user will often need to prepare extra adapters, hubs, and chargers. This process can make the whole experience of using a USB-C laptop rather frustrating.

SIMPower creates a User-friendly, All-in-One Solution for USB-C Laptop and Device Users

To entirely ease the burdens faced by USB-C laptop and device users, SIMPower, a Taiwanese tech startup, has designed an intuitive, all-in-one power and signal transmission solution called "Hyport" (Hybrid Port) which can replace the most commonly used laptop accessories, such as AC adapters, AC USB chargers, USB 3.1 Gen1 Hubs, and USB to HDMI Dongles.

Hyport is a hybrid AC notebook adapter with signal transmission functions that can complement various USB-C laptops. With the Hyport's features, laptop users will no longer have to worry about constantly carrying additional USB-C ports and accessories. According to SIMPower, top Taiwanese brands Acer and Asus have already shown interest in Hyport, while Lenovo, the largest Chinese PC manufacturer, has already brought Hyport to their US Retailer Conference in October 2018, where the product won a warm reception.

SIMPower will take the opportunity to join CES 2019 and have their product introduced to US PC brands such as Dell, HP and Apple, as well as various system integrators.

Hyport can perform the functions of a traditional AC power adapter, supply transmission signals through its USB-A and USB-C ports, and transmit HDMI signals. While charging a laptop, the adapter can be used to supply power to one's smartphone, tablet or digital camera through the USB-A ports. In the meantime, one can also transmit the device's data into the computer. When needed, the Hyport adapter can be used to connect additional equipment and devices as well. When not connected to a laptop, the Hyport can be used independently to supply power to other digital devices through its USB-C or USB-A ports.

A Complicated Design of Power and Signal Integration That Even Apple Couldn't Achieve

Achieving an integrated power and signal USB-C design is a relatively difficult task, even for a major company like Apple. Apple had introduced its very first MacBook laptop model with the USB-C port in 2015, and up until now, the latest model sold by the company still only has one USB-C port. During this period, to meet customers' needs, Apple has been selling various adapters, including the USB-C to USB Adapter, USB-C to Digital AV Multiport Adapter, and Belkin Audio Splitter (3.5 mm-M/2x3.5 mm-F). If one

Ronald Li

SIMPower CEO Ronald Li has always believed that USB-C would be the new standard. He has led his team to acquire 11 patents for inventions related to power and signal technology and there are 41 patent applications in the queue.

For the past five years, SIMPower has been devoted to the research and development of USB-C power and signal solutions.

purchased all these adapters it would cost them more than $100.

Ronald Li, the CEO of SIMPower, explains the reason why power manufacturers have no interest in developing adapters is that power and signal belong to different fields. As the frequencies of power and signal transmissions are different, they will inevitably interfere with each other. The interference can become stronger as the amount of power increases.

In 2014, when they first decided to devote themselves to the development of USB-C power and signal integration, it has taken SIMPower nearly five years to solve the problem of frequency interference. In 2018, Hyport was officially introduced to the market.

A key technology of Hyport that is worth mentioning is the "Smart Cooling Tech" that allows the adapter to always be under the most optimal temperature. Should the adapter heat up after being used to charge too many devices, it would automatically lower its entire power output and distribute the appropriate amounts of power to the connected devices based on their battery capacities. Apart from Hyport's existing ports, SIMPower can also produce customized ports to meet various customer needs, such as adding an Ethernet port or integrating a wireless charger circuit board.

Currently, SIMPower has already obtained 11 patents for invention in the field of power and signal in the US, Japan, South Korea and China. In recent years, SIMPower has also submitted applications for about 41 other patents that are under review. Thanks to the wide and deep scope of patent protections, the power manufacturers and system integrators that want this technology would have to obtain it through SIMPower.

Spending 5 Years to Develop the Perfect Solution in the USB-C Era

Many may be curious about why SIMPower had chosen to devote its attention to a USB-C adapter like Hyport before 2015. At the time of the adapter's development in 2014, only few visionary people had been aware of USB-C's technological potential.

Specs-wise, the USB-C standard offers quite a number of benefits over the traditional standard. Its connector, which is symmetrically shaped, can be used to transmit not only data and power, but also audio and video. This advantage allows it to potentially replace existing electrical connectors such as USB-A, HDMI, 3.5 mm audio, Ethernet and power cables, and connectors. Li, whose main background is in R&D, has always believed that the USB-C format would become the new industry standard.

Today, it would appear that Li's faith in the technology has paid off. In addition to Apple's MacBook, a growing number of PC brands have begun to adopt the USB-C standard. USB-C ports can also be found in more and more non-PC devices, such as Apple's newly released iPad Pro and Nintendo Switch. In the European markets, the outlook for the USB-C format is improving as well. By 2021, the USB-C standard is expected to be applied to all mobile devices sold in the EU.

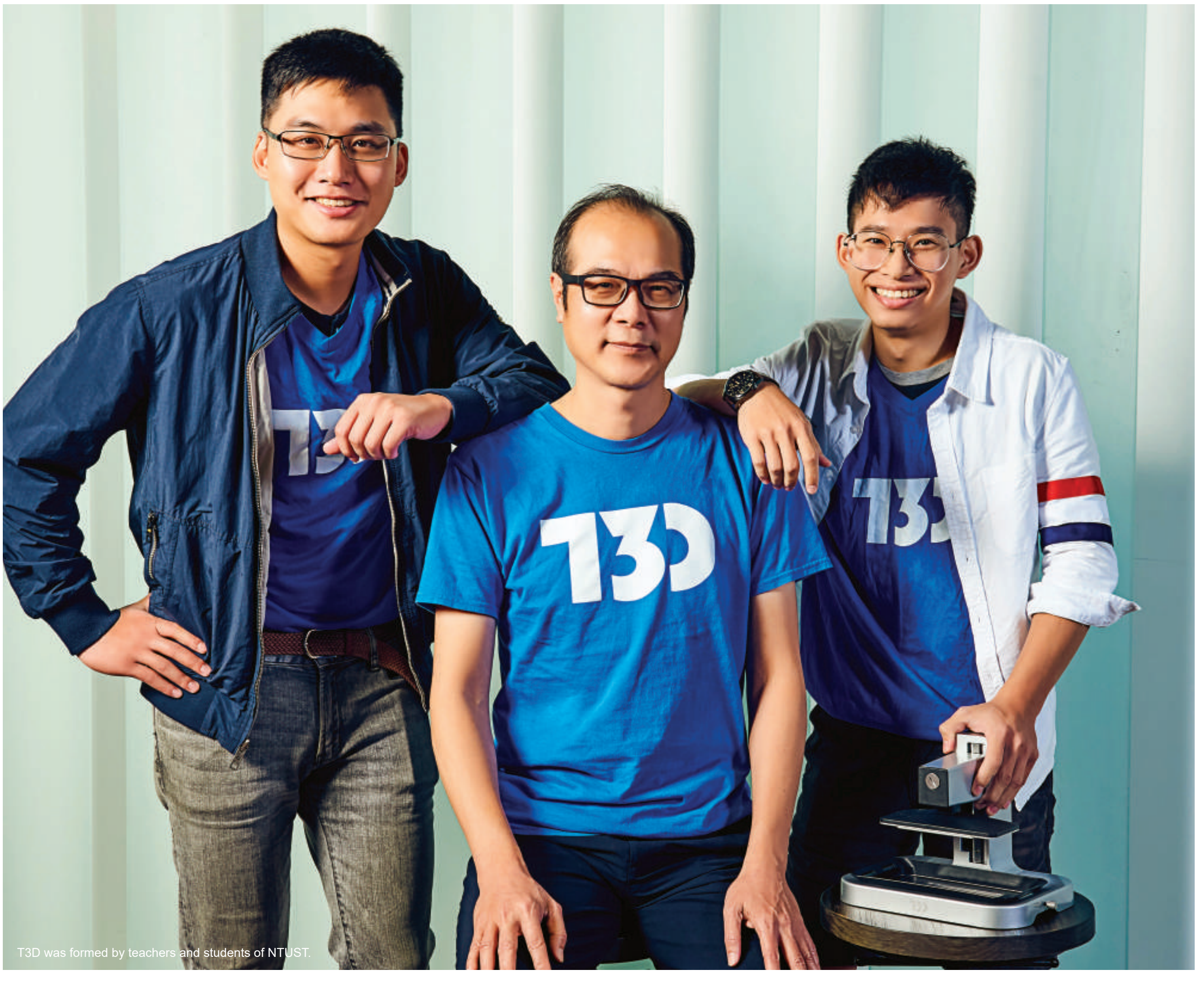
For now, Hyport remains the perfect solution just for end-users. To expand its presence, the team at SIMPower will continue to seek new supply chain partners and system integrators. SIMPower's goal is to eventually become the industry's one-and-only provider of power and signal solutions for all the end user devices.

Hyport can perform the functions of a traditional AC power adapter, supply transmission signals through its USB Type-A and Type-C ports, and transmit HDMI signals.

The Four Main Roles of Hyport: AC Notebook Adapter/ USB-C Charger/USB3.1 Type A Charger/USB to HDMI Dongle

T3D AND THE WORLD'S FIRST MOBILE 3D PRINTING SOLUTION

NTUST Shattered 3D Printing Price Barriers with Revolutionary Product



T3D was formed by teachers and students of NTUST.

PROFILE

T3D was formed by teachers and students of National Taiwan University of Science and Technology (NTUST). T3D spent five years developing the world's first mobile 3D printing solution; also the world's smallest and most cost-effective 3D printer based on vat polymerization technologies, which makes 3D printing more popular and affordable.

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3D printing has emerged as a revolutionary technology in recent years. Initially designed for industrial applications, 3D printing has become increasingly popular in the manufacture of airplane and car parts, houses, guns, and dental materials, thanks to lowered entry barriers and costs. The development of chemical ink is also likely, which can be used to 3D print medicine in the future. For consumers, 3D printers will no longer be a luxury. A Taiwan startup has developed a mobile 3D printing solution targeting the design and educational markets, making this technology an affordable product.

This mobile 3D printing solution was developed by a team led by Jeng-Ywan Jeng, a professor of the Department of Mechanical Engineering at NTUST (National Taiwan University of Science and Technology). The team, formed by teachers and students, spent five years developing the world's first mobile 3D printing solution; the world's smallest and most cost-effective 3D printer based on vat polymerization technologies. The team also developed an app to provide access to a cloud-based image library. Besides the special layering function, the app will enable users to create a 3D model by pressing one key, significantly simplifying 3D printing processes.

Most Cost-effective 3D Printer Using Visible Light in Vat Polymerization Processes

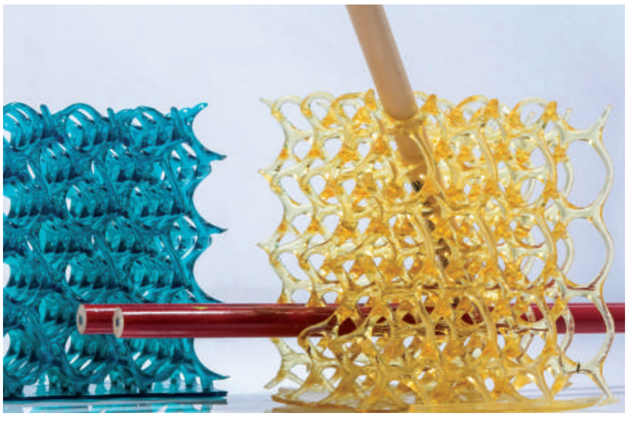
After the mobile 3D printing solution was developed in 2016, this research team decided to set up their own business by founding the company T3D (Taiwan 3D Tech). T3D has recruited talent from different fields such as Ming-Zheng Huang, a former manager in a display company. Serving as the CEO at T3D, Huang is responsible for the company's marketing and management affairs.

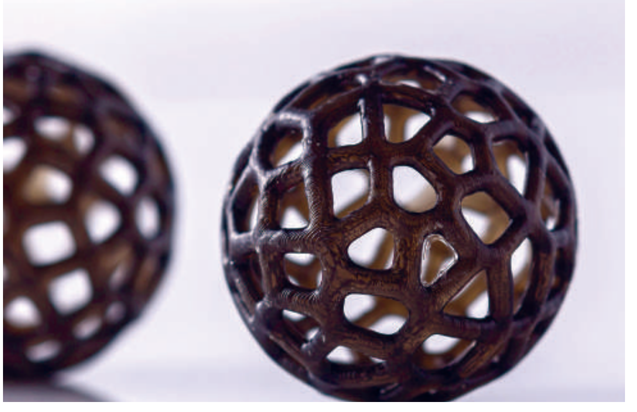
Huang says the mobile 3D printing solution is the result of combined research between academia and the industry. The mobile 3D printer combines field knowledge in opto-mechatronics, materials, communications, and IoT, creating a new segment between entry-level models with lower resolutions using FDM technologies (Fused Deposition Modeling) and high-end models featuring higher resolutions using UV light or laser beams for vat polymerization. Using the light source from a mobile phone in vat polymerization processes, the mobile 3D printing solution is far cheaper than 3D printers costing $1,000 and even thousands of US dollars. Compared to other 3D printers based on vat polymerization technologies, T3D's mobile 3D printing solution is undoubtedly the most cost-effective choice in the market.

In shattering the price barrier, the research team eyed the mid-range market segment. Although using a smartphone as the light source for vat polymerization can reduce costs, the light is weaker than UV light or laser beams. Therefore, the team needed to develop a resin that cures in visible light to accelerate curing. Five years ago,

Ming-Zheng Huang

Formerly a manager at a display company, T3D CEO Ming-Zheng Huang is responsible for the company's marketing and management.





The eco-friendly resin is odorless and can be removed with water and dishwashing liquid instead of alcohol after vat polymerization, which makes the whole process simple and safe.

curing one layer took 10 minutes and now it only takes 20 seconds. However, this result took five years to achieve.

Cloud Sharing and 3D Modeling Services with a Focus on Widespread Consumer and Educational Markets

The research team also created an app and cloud platform, allowing users to operate on the app and transmit data to the cloud. This service took the team two years to complete. According to Huang, the cloud platform not only helps in the sharing of data but also in cutting hardware costs, not to mention the ease of software upgrades.

Currently, the team is in the middle of overcoming a major challenge – 3D modeling. Traditionally, 3D modeling is done by using computer-aided design software or 3D scanners. However, creating a 3D model is difficult for consumers, whether manually or autonomously. According to Huang, manual 3D modeling is required for T3D's first-generation mobile 3D printing solution, but will no longer exist in the second-generation product, which is under development. In the future, 3D modeling will be completed automatically in the cloud, making the product more user-friendly.

In September 2017, the team launched a crowdfunding campaign for its first-generation mobile 3D printing solution on Kickstarter, offering a unit price that was nearly half of the market price at $219. A total of $160,000 was raised, giving the team a massive boost. The first-generation product is targeted at professional designers, makers, and the educational market.

The reason for selecting the educational market is due to the high level of security provided by the product, according to Huang. Firstly, using smartphones as the light source poses no risk of eye damage. Secondly, the eco-friendly resin developed by the team is odorless and can be removed with water and dishwashing liquid instead of alcohol after vat polymerization. Thirdly, the finished 3D object will cure in 15 minutes in water under a fluorescent light, eliminating the need for a curing chamber, which costs more than $500. The whole process is simple and safe, allowing users not to worry about the high temperature of the extruder nozzle and the carcinogenic fumes released while printing.

The research team has designed a prototype of the second-generation mobile 3D printing solution. Once

Five years ago, curing one layer took 10 minutes. Now it only takes 20 seconds for a resin to cure in visible light.

the development of the product is completed, T3D will expand to more market segments. Huang says 900 units of the first-generation product have already been shipped, including those on Kickstarter. Consumer 3D printers are still a niche market with an annual shipment volume of one million units, far behind the market volume of other consumer 3C products. That means the consumer 3D printer market has the potential to grow to more than 10 million or even 100 million units. As the market volume grows, blockchain technology can be applied to the cloud. The 3D graphics will then be available for transactions after modeling to create a new revenue source for business.

Focused on Research and Design in Taiwan, T3D Targets Southeast Asian Market First

3D printing is currently one of the most popular technologies in the world. As competition intensifies from latecomers, T3D is challenged with maintaining its competitive advantage. However, Huang is not worried about it as the team has filed patent applications for the equipment and resin used to develop the mobile 3D printing solution. Even if the number of knock-offs increases, Huang believes T3D has gained a head start. Besides the second-generation product, T3D will continue to develop the third- and fourth-generation models featuring more enhanced functions.

Development is ingrained in the DNA of T3D, which started out as a research team at NTUST. While they are not worried about product innovation, marketization has posed a huge challenge for them. Huang says the team spent six months on communications, from molding to production. The team has had difficulties finding partners due to a small production volume and the need for a wide variety of molds and electronic materials.

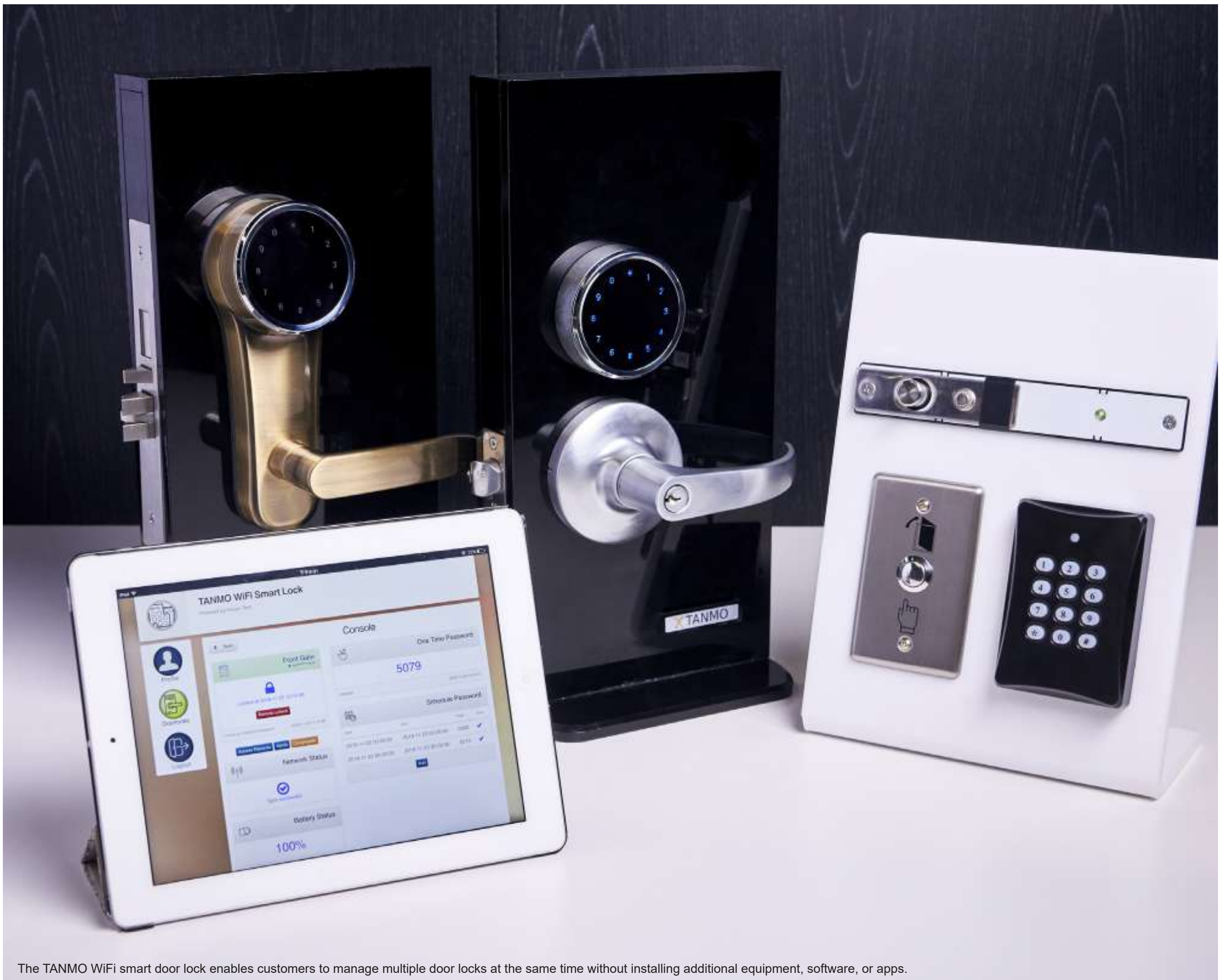
Then the mass production plan was hit by the global shortages of electronics components. After negotiating with the suppliers through the help of NTUST's alumni in the electronics industry, T3D finally acquired all the needed components in August and started shipping in September. Without past experience, the students were forced to learn by doing.

Initially targeting the Southeast Asian market, T3D has signed an exclusive distribution agreement in India with product verification for the educational market. Besides targeting Singapore and Malaysia, where T3D has demonstrated their product at exhibitions in preparation for market entry, Vietnam, the Philippines, and Pakistan are also T3D's potential markets. For the European and US markets, T3D will first focus on online sales. After showcasing the product at CES in collaboration with TTA, T3D is expected to establish a leading position in the consumer 3D printing market with its mobile 3D printing solution.

T3D's mobile 3D printing solution uses smartphones as the light source for vat polymerization and provides an app and cloud platform for easy operation.

GROWING FROM DIGITAL TO SMART DOOR LOCKS

Specializing in System Integration, Hoyen Tech Aims to Become No.1 in the IoT Market



The TANMO WiFi smart door lock enables customers to manage multiple door locks at the same time without installing additional equipment, software, or apps.

PROFILE

HoyenTech is an IoT company dedicated to assist customers to develop smart devices. They have rich experience in wireless technology and building proprietary communication protocols to empower IoT projects. They also offer custom device design in hardware and cloud connectivity.

https://www.facebook.com/hoyentech/
support@hoyentech.com
http://www.hoyentech.com/

The IoT trends will change consumers' behavior while creating enormous business opportunities in hardware and software integration. IT giants will not dominate this gigantic market; as every company with IoT system integration capabilities has a chance to grab a share of it. Among the Taiwanese electronics companies specializing in system integration, Hoyen Tech is one of the top brands. Founded four years ago, Hoyen Tech has developed the TANMO WiFi smart door lock.

Hoyen Tech will showcase at CES 2019 with the TANMO WiFi smart door lock designed by Taiwanese engineers. While the WiFi IC and controller IC is provided by foreign manufacturers, the door lock adopts modules and cloud system developed by Hoyen Tech. The TANMO door lock was designed for small shared spaces such as the B&Bs or small conference rooms.

Adoption of In-house Wi-Fi Module Increases the Commercial Agility of TANMO

The feature of TANMO is that it adopts a Wi-Fi module developed for connecting with the back-end cloud management system. After the administrator of the venue enters their identity information, the system will generate and issue a PIN code (ID code). After receiving the PIN code, the renter can open the door with the code. The administrator can also set up an expiration date for the PIN code on the cloud management platform to reduce management costs. No extra devices or applications are needed in the entire process, which significantly improves the convenience for property owners and the renters.

Despite a large number of smart door locks in the market, most of them have lower commercial agility than TANMO. For example, most digital door locks target the home market. As data is transmitted via Bluetooth, customers need to download apps and go through numerous steps from registration to settings and key sharing, making these door locks an impractical option for short-term renters. In addition, customers have limited choices of locks.

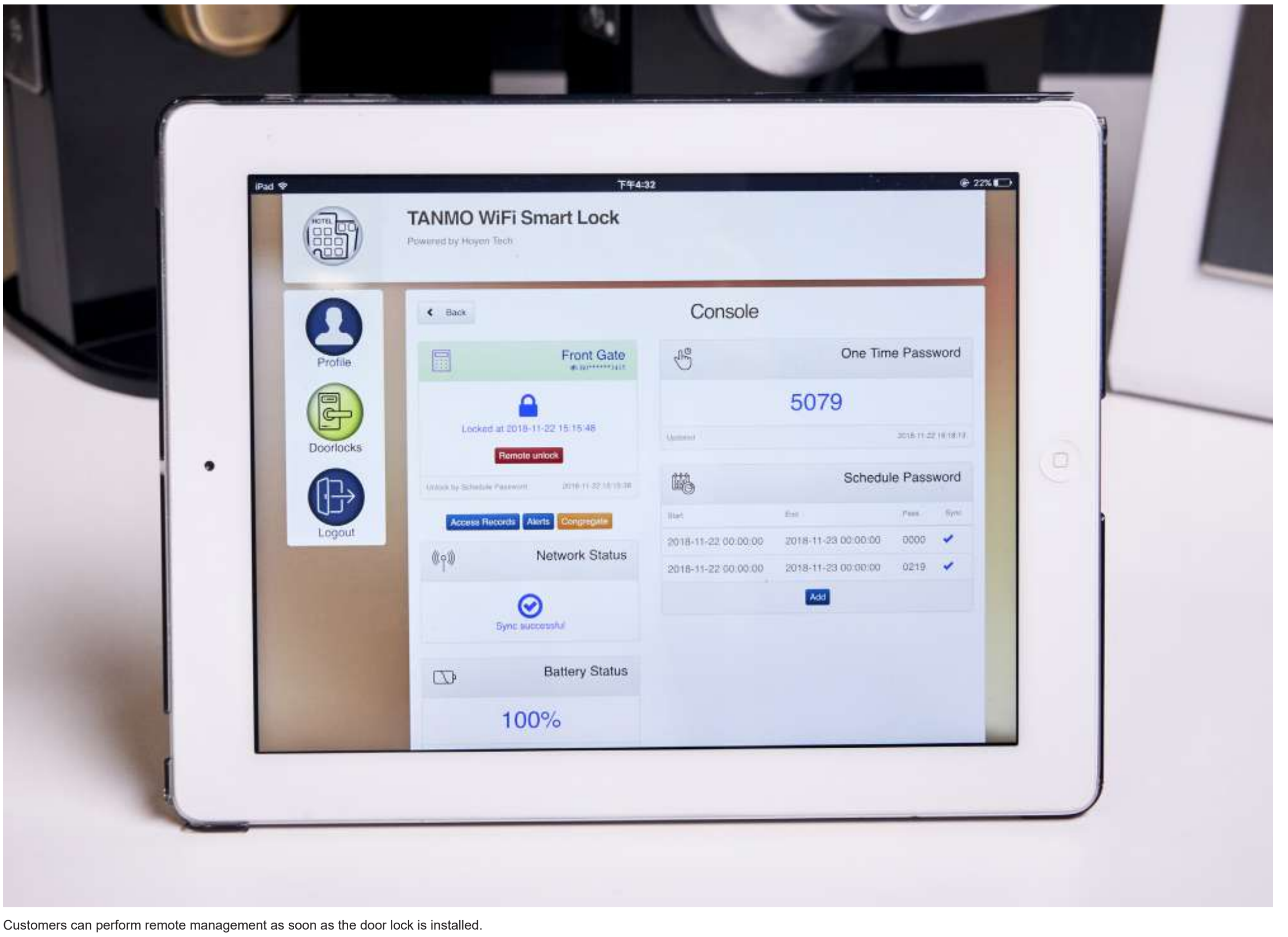
TANMO is the first product completely developed by a system integrator. Apart from a high level of reliability, the lock uses Google's cloud platform. In other words, TANMO is compatible with any device using the Google system, eliminating the need for downloading additional apps. The lock also comes with an intuitive management platform. So far, TANMO has been widely adopted in Taiwan. Customers can manage their B&Bs remotely, say in Taitung when they are in Taipei. Treerful, a space rental company, is one of the customers.

Built up a Competitive Edge from Contract Design Services and Integrate Product Innovation with Traditional Manufacturing

Established in 2014, Hoyen Tech was formed by a group of engineers with IoT system development skills. With

Roger Lin

Roger Lin, CEO at Hoyen Tech, plans to target the Taiwanese and Southeast Asian markets first and increase product value through hardware and software integration.



Customers can perform remote management as soon as the door lock is installed.

years of experience and solid skills, these engineers decided to set up a company with their college classmates after sensing the business opportunities in the IoT market. Instead of developing products, their initial plan was to provide IoT system design services. After working with industry leaders Broadcom and Intel as well as designing the tea making system for a Silicon Valley startup, Hoyen Tech built a solid foundation for its business.

In 2016, they decided to develop their own IoT product. The simple-looking WiFi smart door lock took them 20 months to develop and the biggest challenge was the lock instead of the IoT system. Felix Lien, Assistant Vice President of Development at Hoyen Tech, says the company spent a year looking for a lock manufacturer capable of meeting their reliability requirements, as Hoyen Tech had no knowledge of locks. TANMO boasts an endurance of 800,000 cycles compared to the 200,000 cycles of the door locks used in the home.

Communications and negotiation also posed enormous challenges for Hoyen Tech. Such challenges usually occur when a revolutionary product requires the help of a traditional manufacturer. Lien says that they are capable of integrating the hardware, microwave components, firmware, software, and cloud platform, but they needed someone who is proficient in manufacturing locks. With a small production volume, Hoyen Tech had difficulty finding a manufacturer. However, by taking on custom projects that require the production of a wide variety of products in small volume, Hoyen Tech has developed a sharp eye for IoT market demand and abundant design experience.

Roger Lin, CEO at Hoyen Tech, says the company is currently targeting the Taiwanese market and will tap into Southeast Asia in the first half of 2019. Hoyen Tech is not planning to make inroads into China yet as Google is still blocked there and Taiwanese door locks adopt European and US standards, different from China, Korea, and Japan. In the future, Hoyen Tech will focus on the enhancement of TANMO. As the core module designed by Hoyen Tech can be used in all kinds of locks, the company will work with door lock vendors to develop different form factors.

Train Hardware and Software Integration Talent to Create Value in IoT Market

Between 2000 and 2010, there were a large number of companies engaged in the production of digital cameras, GPS

800K

The endurance of cycles that TANMO has been designed to withstand

$520B

IoT market predicted to double by 2021 compared to 2017

22.1%

The penetration rate of smart home devices is expected to hit by 2023

devices, and sports equipment with embedded systems. Lin recalls the days when he and his team members landed their first jobs after graduation. During that time, the Taiwanese electronics industry was thriving, so a career in the electronics industry was a natural course for engineers. They did not need to make many difficult decisions but to develop products according to their companies' strategies and just keep moving up the corporate ladder.

As the Taiwanese electronics industry shifted to contract manufacturing services, many consumer products are now produced in China. Lin has thus faced difficulty in recruiting system integration talent. In addition, young people nowadays are reluctant to be engaged in manufacturing hardware, as they are more interested in jobs related to the Internet. This is why Lin has decided to set up a company with like-minded partners. Lin truly believes hard times create heroes and a downturn in the industry is a great opportunity for starting a business.

In addition to launching a multilingual website optimized for search engine ranking as part of its global expansion plan, Hoyen Tech is also looking for distributors. By exhibiting at CES, Hoyen Tech hopes to promote the TANMO smart door lock while seeking partners willing to install or sell the product.

Hoyen Tech's vision is to make consumers think of their brand when they think of IoT products, like Hon Hai comes to mind when people talk about mobile phone EMS providers. If Hoyen Tech wants to prove their value in the IoT market, they will have to count on the TANMO smart door lock. Hoyen Tech's other ambition is to train hardware and software integration talent in Taiwan. Lien believes the Taiwanese hardware manufacturing industry will regain its momentum in the IoT era.

Roger Lin, CEO (middle), Felix Lien, Assistant Vice President of Development (left) and Julian Ho, Vice President of Sales (right) are the core members of Hoyen Tech.

TAIWAN TECH ARENA Event Summary

TTA Will Be Holding Regular Forums Covering a Broad Scope of Topics

Taiwan Tech Arena (TTA) has chosen 44 startup teams that will showcase their technological innovations at Taiwan Pavilion in Eureka Park during Consumer Electronics Show (CES) 2019 in Las Vegas from 8th to 11th of next January. Members from the CES General Assembly and experts from the Silicon Valley were invited by Taiwan's Ministry of Science and Technology (MOST) to assist in the vigorous selection process. The startups will get opportunities to market their brilliant ideas at the upcoming event.

44 Teams Have Been Chosen by TTA to Exhibit at Taiwan Pavilion in Eureka Park during CES 2019

Taiwan Tech Arena (TTA) has chosen 44 startup teams that will showcase their technological innovations at Taiwan Pavilion in Eureka Park during Consumer Electronics Show (CES) 2019 in Las Vegas from 8th to 11th of next January. Members from the CES General Assembly and experts from the Silicon Valley were invited by the Ministry of Science and Technology (MOST) to assist in the vigorous selection process. The startups will get opportunities to market their brilliant ideas at the upcoming event.

TTA Will Be Taking Startups to Other International Expos

TTA will continue to select and send startups to major trade shows around the world. So far, 87 different startup teams have been chosen to showcase their technologies and products in events such as CES in the US, Techfest in Vietnam, Echelon Asia Summit in Singapore, and etc.

TTA Matches Domestic Startups with Global Accelerators

TTA has recommended two startups to directly enter the second-round interview for the UC Berkeley's SkyDeck program. TTA is a Global Strategic Partner with the program, and each year two candidate startups will be recommended. As the first government-backed incubator, TTA is working with 29 domestic and 23 foreign startups. Four global accelerators – BE Accelerator, MOX, SparksLabs Taipei, and IAPS – are also stationed at TTA to help entrepreneurs develop international connections.

Meet Taipei Startup Festival 2018

During the Meet Taipei Startup Festival held from November 15th to 17th, TTA hosted a forum on innovations in Taiwan and Israel. Afterward, Taiwan Innovation and Entrepreneurship Center (TIEC) held a "pitch and match" session where 20 startups cultivated by TTA introduced their ideas. Dr. Dan Sechtman, Nobel Prize laureate in chemistry, was also invited to the TTA center to talk about his startup in Israel. He met with 10 local startups and gave them insights on growing businesses.

Techstars Startup Week Taiwan

From December 3rd to 7th, TTA hosted a celebration of domestic entrepreneurs. The five-day event, called Techstars Startup Week Taiwan, aimed to inspire and strengthen Taiwan's and East Asia's entrepreneurial communities via more than 20 free networking and workshop sessions that covered AI, healthcare, fintech, advanced manufacturing, and corporate innovations. Attendees had access to dozens of programs, influential keynote speakers and fundraising opportunities. Mentoring sessions with CEOs and funders were also held at venues across the Taipei-Keelung metropolitan area.

2018 TTA SingularityU APAC Global Impact Challenge Final Pitch

TTA and Singularity University (SU) jointly held the 2018 SingularityU APAC Global Impact Challenge (GIC). The purpose of GIC is to foster startups and moonshot innovations that may positively impact the lives of people in Asia Pacific and around the world within the next decade. The final pitch and result announcement took place on August 10th, and the winners were admitted to SU's Ventures Incubator in the Silicon Valley this fall. This contest was sponsored by MOST and TTA.

Silicon Valley Innovation Open House

On October 29th, TTA held a panel discussion featuring leaders of venture capital firms including Jeffrey Lonsdale (Founders Fund), Joseph Huang (Infinity Venture), Jamie Lin (appWorks Ventures), and Bryan Baum (Aspen Capital). The panel was hosted by Jason Hsu, a member of the Legislative Yuan and an advocate of the blockchain technology. Panel members offered insights on the international market and how international investors perceive local startups. The event was an excellent learning experience for all participants.

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Copy Editor | **Jade Lu, Irene Chiang, Stan Huang**
Senior Production Editor | **Ryan Hsu**
Production Editor | **Neil Yu**
Social Media Editor | **Dustin Craft, Rita Huang**
Photographer | **Oliver Jhuang, Lynn Wan**

DIRECTOR & TEAM

Director Manager | **Dr. Lewis Chen**
Senior Director | **Dr. Huber Chen, Wu-ni Chaung, Jason Chang, Gloria Hsiao**
Project Manager | **Carlo Huang**
PM Team | **Maruko Chen, Carol Huang , Elsie He, Nicole Cheng**

Marketing & Event

Branding Director | **Betty Hsu**
Event Director | **Elley Yang**
Coordinator | **Alison Wu, Alison Chen, Ja-Yu Chang**

Research & Engagement

RE Director | **Rich Fu**
Coordinator | **Dr. Micheal Ho, Dr. Julio Lin, Dan Lin, Benny Yang,
Danny Lin, Sylvia Chang, Marco, Elllen Pi, Ken Lim, Greg Hou, Vic Fan**

Operation Team

Director | **Eleanor Chuang**
Coordinator | **Patty Lin, Gina Yu, Rebecca Cheng, Karei Ko**

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