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## Awards and Commendation

### National Yunlin University of Science and Technology (YunTech) Shines the World at the International Salon of Inventions & New Technologies!

The research team of National Yunlin University of Science and Technology (YunTech) wowed the world at the International Salon of Inventions & New Technologies held from September 27th to 29th, 2018, at Sevastopol, Ukraine. YunTech grabbed 3 gold, 2 silver and 2 special medals this time.

The 3 gold-medaled products are listed below.

The first gold-medaled product, Autonomous Mobile Nursing Station, was invented by student Lou Shi-tong under the instruction of Associate Professor Ho Chian-chen from the Department of Electrical Engineering, and the product won the special medal as well. This product features two functions, light detection and ranging

(LIDAR) with simultaneous localization mapping (SLAM) techniques and dynamic window navigation for obstacle avoidance. With the functions above, the mobile nursing station can run autonomous navigation, monitor pedestrians and carry out autonomous surveillance to provide artificial intelligent autonomous surveillance services. The product can be placed in big hospitals or care centers to replace traditional nursing carts. It is believed that the product can reduce the working load of health care workers and surveillance cost of hospitals.



Photo of the use of Autonomous Mobile Nursing Station



The second gold-medaled product, Air Cleaner Driven by Ergometer, was invented by student Hsiao Yu-ting under the instruction of Professor Cai Deng-chuan from the Department of Industrial Design and the product was the special-award winner as well. The cycle ergometer includes a stationary bike and an air cleaner. The resistor of the stationary bike is a turbo fan which produces air flow through a filter to purify air. The purified air will then flow to the exerciser through a pilot tube. Not only can the body temperature of the exerciser be lowered, but the air can also be purified. There are five features of the ergometer: 1. The kinetic energy consumed by the exerciser can drive the air cleaner to purify the air. 2. The power driving the air cleaner becomes the resistance for the stationary bike, and the resistance can be adjusted in accordance with the preference of the exerciser. 3. The ergometer provides the air flow to lower the body temperature of the exerciser. 4. The air can be purified when the exerciser is using the ergometer. 5. Clean air will be produced while the exerciser is doing exercise. It can be seen that exercisers don't need to use any electric power or any other types of power to have the air cleaner work since the power for the air cleaner is already produced by the exerciser while he/she is using the ergometer. Also, the purified air is better for the exerciser's health and the exerciser will feel more comfortable when his body temperature is lowered by the air flow.

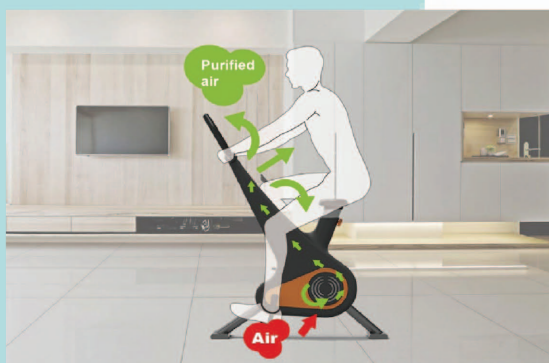


Photo of Air Cleaner driven by Ergometer

The third gold-medaled product, *Performance Enhancement of Flexible Organic Light-Emitting Diodes with Multilayer-doped Structure*, was invented by students Hong Tsong-kai and Hsu Li-long under the instruction of Associate Professor Lin Jian-yang from the Department of Electronic Engineering. Organic light-emitting diode (OLED) holds the following advantages: autonomous light-emitting, thin thickness, faster

response time, wide viewing angle, higher contrast ration, high luminance, flexibility and the ability to be produced over a large measurement area. Due to the above advantages, OLED has been considered as an important technique for new flat panel displays and green lightning. The multilayer-doped structure was adopted to construct a luminous layer of OLED that would have a better quantum effect. In this way, luminous efficiency of OLED could be increased to advance its luminance. For example, if Spiro-NPB/TBADN:Rubrene/Alq3/LiF/Al adopts the multilayered-doped structure of this product, the luminous efficiency and luminance increases 200% compared with one that doesn't use the structure. Subsequently, the Spiro-NPB/TBADN:Rubrene/Alq3/LiF/Al can meet the needs of green lightning with high luminance and flat panel displayers. The technique can be applied to newly green lightning units and newly flat panel displayers.

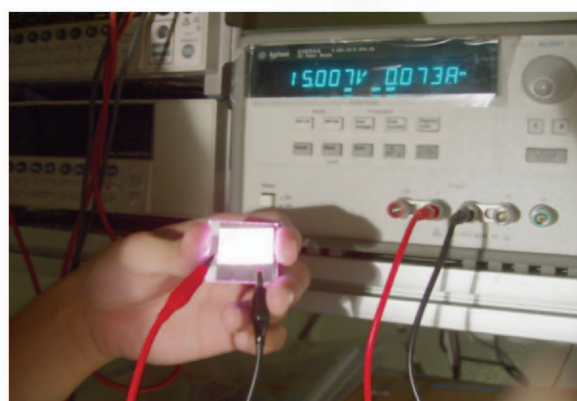


Photo of Performance Enhancement of Flexible Organic Light-Emitting Diodes with Multilayer-doped Structure

The 2 silver-medaled products are listed below.

The first silver-medaled product, *Elderly Company and Nursing with Remote Control Robot*, was invented by students Zen Chia-hau and Hong Ming-chi under the instruction of Professor Hsia Shih-chang from the Department of Electronic Engineering. The intelligent robot is equipped with remote control and sensitive functions which can monitor distant images and sense distances. The robot has one micro-remote which is connected with an electronic unit driver to control the 2-wheel motor and adjust the speed. The micro-remote is connected to a tablet through an app, and the data can be transferred via these two devices. The tablet is placed on the intelligent robot to establish a human-computer interface; the monitoring device is equipped with a camera. Through the two digital motors which



are controlled by a micro-remote, users can move the lens up, down, left or right on their own will. The images shot by the camera will be sent to the tablet for further monitoring or any follow-up actions; the remote device is connected to the tablet via Wi-Fi to send data or transmit signals, thus achieving the motor function of controlling the intelligent robot by remote control.

The second silver-medaled invention, Copolymer Based on 3,6-di(2-thienyl)carbazole and 2,2'-bithiophene and its Application on Satisfactory Long-term Switching Stability and High Optical Contrast Smart Window, was invented by students Gou Chong-wen, Lai Sui-yu, Huang Shen-wei, Li Chen-jun and Chou Kai-jie under the instruction of Associate Professor Wu Tzi-yi from the Department of Chemical Engineering. In the recent years, people have more risk awareness of global warming and the concept of energy-saving has become a world-wide issue, creating more opportunities for the use of smart windows. This invention is like a unique skill displayed by a magician, one where he makes a person disappear and then reappear on the stage. With little electricity, the smart window can present changes of colors in front of your eyes. The feature of this invention can be used to block light and heat into buildings to save energy.

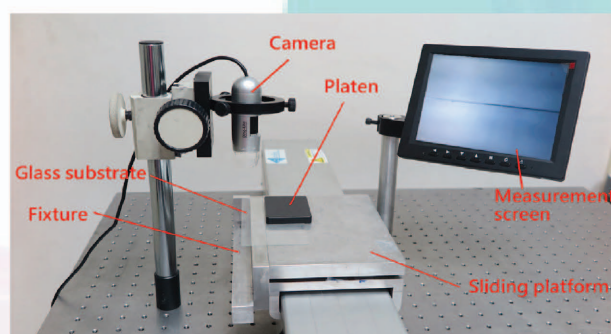
The recent R&D results of YunTech do meet the needs of the industrial field and make life more convenient. The business potential of the results is big. The outstanding performance this time did not only fully present the power and achievements in start-up businesses, but also showed that teachers and students did their best in academia-industrial cooperation and creative inventions.

### **YunTech Made its Reputable Mark at the 2018 Seoul International Inventions Fair (SIIF)!**

The 2018 Seoul International Inventions Fair (SIIF), the greatest invention fair in Asia, took place from December 6th to 9th at the COEX Center, Seoul, South Korea. The invention fair attracted 687 inventions from more than 30 countries. The 6 inventions from YunTech won 2 gold, 3 silver, 1 copper and 1 special awards.

The two gold-medaled inventions are listed below.

The first gold-medaled invention, The Measuring Method and Device for the Glass Substrate, was invented by students Lin Rui-chang, Chou Shi-feng, Lu Wei-ren and Lin Chia-you instructed by Professor Wang Yung-cheng from the Department of Mechanical Engineering. This invention also won the special award this time. This measuring method inspects margin and sizes of terminal faces of glass substrates. Through image acquisition and processing, users can use the measuring method to inspect and know if the sizes of the glass substrate meet the precision they expect. With the measuring method, users can obtain more convenience as they lower the working load and save on labor costs. Moreover, accuracy and inspection efficiency can be increased with the help of the measuring method. When the amount to be inspected is huge, the measuring method can still assist users in maintaining quality inspection.



The photo of the invention The Measuring Method and Device for the Glass Substrate.

The second gold-medaled invention, A Modular Multi-Speed Inner Transmission for Medical Aids, was invented by students Lin Tsong-yi, Kuo Tzu-wei and Huang Kue-hua under the instruction of Professor Wu Yi-chang from the Department of Mechanical Engineering. This invention can be applied to manual self-propelled wheelchairs on the market. Users can propel wheelchairs through a joystick, thus reducing the probability of chronic sports injury caused by the traditional manual self-propelled wheelchairs. There are 4 speeds that users can choose depending on different road situations. Moreover, the invention is a modular design which can be directly installed to the axle hole of one rear wheel of the wheelchairs on the market. Besides being applied to the manual wheelchairs, the invention can be applied to electric-powered wheelchairs. By changing the speed when moving on different topographies, the power output of the motor will continue with a high operating efficiency and the



speed changes can increase the age limits of motors and endurance of cells.



The photo of the invention A Modular Multi-Speed Inner Transmission for Medical Aids.

The three silver-medaled inventions are listed below.

The first silver-medaled invention, Dye-sensitized Solar Cell, was invented by the research team grouped by Associate Professor Liao Yi-hung of Transworld University, Professor Lai Chih-shien from the Department of Electronic Engineering and students Chu-Chia-min, Lin Yu-ren and You Pei-hung led by Professor Chou Jung-chuan from the Department of Electronic Engineering. The purpose of the invention is to create one solar cell which can be manufactured easily, is less harmful to the environment, and can increase photoelectric conversion efficiency of units. The invention, which is an invention to be used in the green energy industry, can be applied to lighting systems in our daily life and building glasses which can block sunlight and heat and generate electricity.

The second silver-medaled invention, Toolbox for Lotus Pick-up, was invented by students Lin Yen-kuo, Zou Wen-ru, and Chu Yun-ting under the instruction of Associate Professor Wong Ju-joan from the Department of Industrial Design. Lotus grows in muddy lands, which causes farmers to lose their balance and fall easily. This invention integrates a knife and a walking-assistant to ease the process of pick-up of lotus seedpods. Also, the bag adopts the original kagiami material, generally used for traditional shopping bags in Taiwan, to reserve the specialty of the local agriculture. The front side of the invention is a knife. Farmers can cut off lotus stalks with single hand, then the seedpod will fall into the bag automatically.

The third silver-medaled invention, Trash Can Featuring Autonomous Patrolling and Surveillance, was invented by students Li Chia-wei and Lou Shih-tong instructed

by Associate Professor Ho Chian-chen from the Department of Electric Engineering. Traditional trash cans are fixed in some remote corners which can be easily found. Normal people may have difficulty in finding a trash can or choose the easiest way to dispose of their trash, namely littering. However, the invention can pick up trashes with its autonomous patrolling and surveillance features, creating better and more effective use of janitors. Moreover, traditional patrolling and surveillance service only depends on fixed security surveillance cameras, which results in some remote corners being difficult to monitor, and the safety loophole is then raised. With the use of autonomous patrolling and surveillance, it is believed the use of security service personnel can become greater. The invention can acquire accurate, efficient, and reliable "pedestrian monitoring", "a self-GPS" and "local environment constructed map" based on the robot platform and two-dimension ranger sensor.

The copper-medaled invention, Efficiency Improvement of Silicon Solar Cells Integrated with Amorphous Silicon-Germanium Films, was invented by students Lin Yi-an and Hsu Li-long under the instruction of Associate Professor Lin Jian-yang from the Department of Electronic Engineering. This invention adopts co-sputter technology to deposit one silicon-germanium film and create a solar cell with one substrate combining a heterojunction of silicon-germanium/si-silicon. When using this invention, conversion efficiency of solar cells will be increased, no expensive and high toxic air is needed, and the manufacturing process is easy. If the si-silicon solar cells on the market add this technology, it is believed that they can increase power generation efficiency by 10 to 15%, consequently increasing the value of the product.

### **YunTech Has an Outstanding Performance at the International Warsaw Invention Show (IWIS)!**

The International Warsaw Invention Show (IWIS) is an invention competition held by the Polish government and is one of the international invention competitions announced by the International Federation of Inventors' Associations. The 12th IWIS took place from October 15th to 17th, 2018 in Warsaw. There were more than 400 inventions from nearly 20 countries. The 6



inventions of YunTech all won awards: they were 3 gold, 3 silver and 3 special medals.

The gold-medaled awards are listed below.

The first gold-medaled invention, A Multilayer Warning Light with Remote Monitor and Overall Equipment Effectiveness Analysis Functions, was invented by students Ho Guan-chun, Lin Yu-ren, Li Wei-tings, Chen Li-shen and Shioun Wei-mei under the instruction of Associate Professor Hung Chung-wen from the Department of Electric Engineering. The invention tries to solve the problem of monitoring machines at factory sites only by human beings, which results in inefficiency regarding timely handling. The Internet of Things (IoT), cloud database, website design and app are integrated in this invention. Without changing anything of machines, the app will automatically inform managing personnel to solve the problems of incoming/output materials and malfunction. Furthermore, the cloud database provides data analysis as well. The advantage of low cost valued at just hundreds of new Taiwan dollars (roughly less than US\$30 dollars) of this invention can highly improve the efficiency of machines, making the invention win the special medal this time.

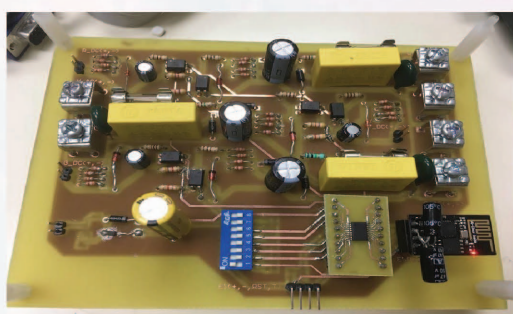


Photo of the invention A Multilayer Warning Light with Remote Monitor and Overall Equipment Effectiveness Analysis Functions invented by the team instructed by Associate Professor Hung Chung-wen from the Department of Electric Engineering.

The second gold-medaled invention, A Modular Two-Input Power-Assisted Device for Bicycles, was invented by the team grouped by Professor Tseng Shih-chang from the Department of Mechanical Engineering, which included Associate Professor Tseng Wan-tsum from the Department of Electrical Engineering and students Chen Chun-ron and Chen Hung-wei led by Professor Wu Yi-chang from the Department of Mechanical Engineering. The electric-assisted bicycles on the market only have two modes and are pretty expensive. Compared with

the disadvantages of the electric-assisted bicycles, this invention adopts a modular-designed device with multiple modes and costs only one-third of the one aforementioned. The high value for the future market led the invention to win the special medal as well.



Photo of the invention A Modular Two-Input Power-Assisted Device for Bicycles invented by the team led by Professor Wu Yi-chang from the Department of Mechanical Engineering

The last gold-medaled invention, Collaborative Laser Beam Shooting on Interactive 3D Images, was invented by students Chang Shen-shioun, Mia Shin-feng, Li Yu, Lai-Chen-yu and Lin Chun-hou under the instruction of Assistant Professor Huang Chien-sheng from the Department of Electronic Engineering. The general shooting game uses sounds to create the sense of immediacy to players when shooting on targets. If players want to have a sense of immediacy in visual 3D images, they have to wear head-mounted devices, which eventually cause inconvenience. This invention adopts the concepts of autostereoscopy 3D and optical projection, making the invention itself light and small. With the smaller and lighter design, players can fully enjoy the sense of immediacy in both visual and hearing. The proper content design uses visual and hearing stimulations to assist players with memorizing the contents of the game, making the game valuable for educational or visual training. With the above features, the invention won the special medal as well.



Photo of the invention Collaborative Laser Beam Shooting on Interactive 3D Images invented by the research team instructed by Assistant Professor Huang Chien-sheng from the Department of Electronic Engineering.



The 3 silver-medaled inventions are listed below.

The first silver-medaled invention, Efficiency Improvement of Silicon Solar Cells Integrated with Poly-Germanium Thin Film, was invented by students Lin Yi-an, Wu Yi-de and Hsu Li-lung under the instruction of Associate Professor Lin Jian-yang from the Department of Electronic Engineering. This invention adopts metal-induced crystallization to create a poly-germanium thin film, inventing a solar cell produced by the heterojunction of Si substrate/poly Ge. A P+ Silicon layer was also formed at the same time. The invention holds the advantages of an increase of conversion efficiency of solar cells, no need for the use of expensive and dangerous air, and easy processing. If the crystalline silicon solar cells on the market apply the technology, the power efficiency and the value of these solar cells can be increased.

The second silver-medaled invention, High Contrast and Rapid Switching Speed Dual-type Electrochromic Devices Based on Poly(3,6-di(2-thienyl)carbazole) and PEDOT-PSS Complementary Electrodes, was invented by students Gou Chong-wen, Lai Sui-yu, Huang Shen0we, Li Chen-chun and Chou Kai-che under the instruction of Associate Professor Wu Tzi-yi from the Department of Chemical Engineering. The awareness of global warming has been raised by human beings in recent years. Therefore, the concept of green buildings has swept the world and the technique of smart windows has gained more and more attention. This new type energy-saving unit causes the elements in the unit to create an oxidation-reduction reaction by means of electrical charging. By using the feature of switching colors to block light into buildings, power consumption of air-conditioning will then be reduced to achieve the goal of energy-saving.

The third silver-medaled invention, Squatting Sport Equipment with Air Cleaning, was invented by student Hsiao Yu-ting under the instruction of Professor Cai Deng-chuan from the Department of Industrial Engineering. The invention can reduce the body temperature of the exerciser and provide clean air indoor. There are 5 features of this equipment: 1. The kinetic forces created by the exerciser can clean the air. 2. The power to drive the air cleaner becomes the resistance for using the equipment. 3. The air flow to

lower the body temperature of the exerciser will be provided by the equipment. 4. The clean air will be provided for the exerciser while using the equipment. 5. Clean air for the indoor area will be produced.

## Academic Exchanges

### **The 65th Annual Conference of Taiwan Institute of Chemical Engineers and the Research Conference of the Ministry of Science and Technology**

YunTech held the 65th Annual Conference of Taiwan Institute of Chemical Engineers and the Research Conference of the Chemical Engineering Division of the Ministry of Science and Technology and the 2018 International Conference of Transport Phenomena from November 9th to 10th.

On the first day of the conference, former Economics Minister Dr. Shih Yen-shiang and Chairman Tai Chien of CPC Corporation, Taiwan, were the keynote speakers. Chairman Woo-Sik Kim of the Korean Institute of Chemical Engineers and other academics from Japan and South Korea were invited to attend the event as well. The 2018 Annual Conference of Taiwan Institute of Chemical Engineers and the Research Conference of the Chemical Engineering Division of the Ministry of Science and Technology attracted more than 900 experts and academics from Taiwan and other countries. This conference intended to provide a platform for domestic and international academics, experts and students to interact.



Photo of President Yang Neng-shu, YunTech, former Economics Minister Shih Yen-shiang (right), and Chairman Tai Chien, CPC Corporation, Taiwan (left).



The 8 issues of 2018 were biochemistry and biomedical engineering, thermodynamic and interfacial engineering, materials on chemical applications, electrochemistry technology, green chemical technology and process system engineering, catalytic reactions, energy and environmental engineering, and transport and separation engineering. The International Transport Phenomena and its Application was also held on the same day, and it intended to bring local academics together. During the conference, an industrial workshop was held for experts from the industry, academia and government to discuss the future development of a circular economy and AI processing in the chemical engineering field.

There were more than 600 papers presented in the form of oral presentations or poster presentations. The oral presentation competition for graduate students was held to cultivate future chemical engineering talents and varieties of prizes were awarded in the closing ceremony. Until the end of the conference, the conference was full of discussions and interactions between experts, academics, and students.



Photo of all the participants of this conference.

## Exclusive Interview

### **Congratulations! Student Tseng Bo-ren Wins the Outstanding Award of Technological and Vocational Education!**

The Department of Technological and Vocational Education of the Ministry of Education announced the 14th winning list of Outstanding Awards in Technological and Vocational Education and gave prizes on December

6th. Student Tseng Bo-ren from the Department of Safety Health and Environmental Engineering was one of the winners this year.



Photo of Former Education Minister Yeh Jiunn-rong and Student Tseng Bo-ren.

Tseng devotes himself to doing research and development on inventions on solar energy, renewable energy, green energy technology, and so forth. His practical ability on inventions is outstanding. In his senior year, he has conquered several energy application competitions through achievements in his seminar course.

The debut of his achievements was at the 2016 Solar Opto-electronics Application Competition held by National Dong Hwa University. In the competition, he presented his research Automatic Oil Expeller Operated with Solar Energy, which won the first award. In the 2017 Energy Technology Application Competition, he even took part in the competition in two different teams, which won a silver and a copper medal respectively.

Besides his great performances in competitions, he was about to apply for a patent for his inventions at that time. He also submitted his paper Synthesis of Cisplatin(IV) Prodrug - Tethered CuFeS<sub>2</sub> Nanoparticles in Tumor-Targeted Chemotherapy and Photothermal Therapy, which was accepted and published by an international journal ACS Applied Material & Interfaces. Furthermore, he used his paper Using Waste Cooking Oil to Synthesize Carbon Quantum Dot to Evaluate Development of Creatures Bodies and Toxic Effect to successfully apply for the Research and Practical



Project of College Students funded by the Ministry of Science and Technology. It is foreseeable that Tseng will definitely create more outstanding achievements in the green environmental technological field in the future.



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