Toh Siew Lok
BME Student Design Award 2022

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Welcome.

About the Toh Siew Lok BME Student Design Award

The IFMBE Toh Siew Lok BME Student Design Award is a jointly organised competition by the National University of Singapore (NUS) MedTech Society, the Biomedical Engineering Society (Singapore) and the International Federation for Medical and Biological Engineering. It is organised in memory of the late Professor Toh Siew Lok, a pivotal figure behind the driving of student education and innovation in biomedical engineering.

The theme of this year's competition is the design of appropriate technology to improve healthcare in resource-scarce communities. The designs will be judged according to the following criteria:
(a) Innovativeness; (b) Potential benefit(s) to healthcare in resource-scarce communities; (c) Low cost and ease of deployment and (d) Viability of the design and potential in reaching the market.

Team 5

Febryan Setiawan
Tzu-Chien Wen
Yin-Chen Lee
You-Liang Xie
Tzu-Hao Wu
Jyun-Siyan Chu

Computational AI-based recognition and edge computing system for heart valve disease.

The primary disease in this study is heart valve disease (HVD), including aortic stenosis (AS) and aortic regurgitation (AR).

Traditional ways to diagnose HVD include electrocardiography, echocardiography, and cardiac computed tomography (CT). However, some of the above instruments are huge and require experienced technicians to operate. While HVD is globally prevalent, there remains many undiagnosed patients worldwide, thus heightening the potential demand and market size for the proposed device, *CARE-Valve*.

The main purpose of *CARE-Valve* is to screen more undiagnosed HVD patients through the adoption of a low-cost and doctor-free approach.

Team 7

Sarah Si-En, Chen
Qian Qian, Han
Jin, Jin

Modular hybrid robotic arm for bedside rehabilitation.

Traditional rigid robots are widely used today in many fields such as automotive industries, nuclear industries and healthcare. They can be specifically programmed to perform highly precise and efficient manipulation tasks. In the healthcare applications, they are mainly used to aid rehabilitation of the patients in the form of robotic exoskeletons. However, due to their rigid structures and poor environmental compliance and adaptability, they possess safety risks when interacting with users. Further, these robots are heavy and bulky, limiting their portability.

The proposed *hybrid robotic arm* demonstrates higher force applications and a larger bending range of motion compared to existing robotic arms made of entirely soft materials. It can potentially minimize safety hazards for users during human-robot interactions while having sufficient payload and range of motion for rehabilitation applications.

Aisyah Ibrahim

Team 8

Miniaturised robotic guide for visually impaired travelling assistance.

The conventional blind-navigation cane, which is commonly used by visually impaired people, is ineffective due to its limited search area. A traditional cane notifies its user if there are walking hazards along the path only upon contact. It is also known that the expenses of these current devices are excessively exorbitant, and the average visually handicapped person cannot afford them. Furthermore, due to the weight, volume, and functions associated with its basic purpose, it has been deemed tough to handle.

As such, the proposed *robotic guide* incorporates sensors calibrated over a number of tests in order to improve judgement accuracy. It successfully integrates IoT through its connection to a mobile phone for GPS tracking and navigation, ensuring that users arrive at their destination safely.

Team 10

Shashaank Abhinav, Venkatesh
Rachel Reno, Lim
Victoria, Tse
Kah Meng, Ang

A novel and cost-effective multi-factor chemical-based lateral flow assay for early detection and outcome prediction in chronic kidney disease (CKD).

In light of the COVID-19 pandemic and the concern surrounding increased mortality for those with comorbidities (of which CKD makes up a large percentage), the silent prevalence of CKD in the global population has risen to attention worldwide. In its early stages, CKD tends not to cause any symptoms, as the body can function even with a handicap in kidney functionality. This is compounded by the fact that urinalysis and blood tests have low accessibility and are ineffective diagnostic tools.

As such, the *Trident* bridges the lab with the dipstick, combining accuracy with ease of use and affordability. It also goes a step further than lab-based tests, monitoring five key biomarkers in urine that specifically correlate to the occurrence and severity of CKD. The *Trident* thus allows users to obtain a more holistic risk profile.

Team 11

Leslie Yessenia Cieza Huane
Julissa Elvira Venancio Huerta
Mateo Santiago Valverde Jara
Diego Aldo Bustos Puga

HIMO

More than 20% of people over 60 years of age suffer from mental or neural disorder, accounting for 17.4% of the years lived with disability in the elderly population. Dementia and depression are the most common neuropsychiatric disorders in this age group. However, these problems suffered by the elderly population are not usually detected in their true dimension. Further, The COVID-19 pandemic has impacted the world especially with digital transformation. As such, many older adults, who stayed at home, have started to see it as an assistive technology.

Our solution: *HIMO*. It is an innovative telehealth application with fast, safe, reliable and economical psychological assistance; with specialized and personalized sessions. In addition, being a telehealth system, *HIMO* contributes to the reduction of COVID-19 infections in the elderly by avoiding the long lines at hospitals, where many infected people are known to be present.

Thank you.