The HKIE CA Division 23/24 Summit – We Automate, We Innovate, CAI Professionals Engineer the Future

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The Shifting Sands in the AI Era

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Introduction

Good morning, Ir Prof KWAN (Provost, HKMU), Ir Dr LEE (Chairman, Organizing Committee), Ir Prof LOCK (Chairman, CAD), Ir Dr GE (Commissioner for Industry (Innovation and Technology), ITIB), Ir Dr LO (LegCo member), Ir Dr LEE (HKIE President), esteemed guests, ladies and gentlemen, I am deeply honored to be invited to give the keynote speech for our CAI professionals from the industry at this summit.

In recent years, our persistent strive to digitization has profoundly transformed the world. Yet, the digitized data, many were still like single grains of sand - isolated, not significant enough, and lacking real impact. But gradually, as more and more devices and sensors connected to the network, these scattered bits of collected information were connected together to become useful knowledge. However, as the amount of data have grown massively, it's not enough to just collect them randomly anymore. We need to strategically gather, refine, connect them together, and apply them in innovative ways.

Definition of Sand Bottle

Allow me to elaborate further on the bottled sand art analogy. In the era of Artificial Intelligence (AI), imagine each grain of sand represents a datum, an idea, a technology, or a piece of knowledge aided by AI, and a glass bottle is a platform with everyone's collective effort that shifts and unifies the collected sand into a cohesive art piece. Also, just as an artist blends pigments to create captivating art, we blend data to forge new paths and unlock endless possibilities. This becomes the colourful sand bottle with coherent colours where efficiency meets sustainability. I believe the bottles of sand art in different shapes and sizes will vibrantly enlighten the fields of control, automation and instrumentation.

C+AI = Control + AI

In more specific words, CAI can also be interpreted as Control and AI, which are crucial for handling data and creating the technologies to improve our lives and achieve our carbon neutrality target. Control and AI indicate that we must gather intelligently and select grains that align with our purpose. Control dictates which data streams flow into our glass bottle. The CAI professionals are the navigators in shifting the sands, dancing with data, and paving the way for the AI era.

Three colours: Blue (Maintenance), Red (Safety), Green (Environmental)

As one of the I&T facilitators of the government, EMSD is in close collaboration with various government departments, academia and I&T companies and committed to enhance the vibrancy of sand bottles for the society. Amongst the wide range of colours of sand, EMSD contributes "blue" for maintenance, "red" for safety, and "green" for environmental concerns. Although they are only three of the millions of colours, I believe that the collective effort from different CAI sectors can create a magical display of diverse colours that symbolizes our commitment to excellence, and sustainability.

Blue (Maintenance)

Firstly, the blue sands underscore the critical importance of maintenance, ensuring smooth operations and preventing unexpected breakdowns. The Airfield Ground Lighting (AGL) is a vital component for safe aircraft operations as it guides the path for planes to safely land in the dark. However, rubber deposits left by landing planes onto the runway surface pose a threat to aviation safety. The process of manually cleaning more than 11,000 lights along the two 3.8 kilometres long runways one by one is very challenging due to the busy operation of the runways.

To overcome this challenge, we are proud to present the innovative Automatic Airfield Ground Lighting Cleaning and Inspection Robot with the collaborative effort from the Airport Authority Hong Kong and the Institute of Intelligent Manufacturing, GDAS from Guangdong Province to revolutionize the maintenance process. This autonomous driving robot features AI image recognition and bolt alignment analysis to optimized operating route and locate the lights. It combines robotic arm controlling and high-pressure dry ice cleaning technology to perform efficient and precise cleaning of the airfield ground lightings. This innovative solution offers a safer and more efficient maintenance strategy for airfield ground lightings.

Red (Safety)

Next, for red sands, which can easily be connected to safety. The Hong Kong Police Force, the University of Hong Kong and EMSD collaborated to invent the Ball Type Rolling Robot. This ball type rolling robot assisted the police force to investigate and explore in advance in potentially hazardous scenarios such as collapsed buildings, confined spaces, trenches and caves. It can also access to narrow tubes which is beyond human capabilities. The robot is also equipped with adjustable cameras for capturing videos from optimal angles and two-way communication to enable real-time control command and feedback.

This innovation allows remote investigation and inspections in locations where conventional large robots or drones cannot access. It would also bring immense contribution to rescue operations, counter-terrorism, hostage situations, and suicide attempts. Safety always comes first but we may have physical limitations. The adoption of AI assisted robots for repetitive or high-risk tasks is one of the sweetest fruits brought by the advancement of technology.

Green (Environmental) and Inventions in Geneva

The green sands symbolize our dedication to the environment, fostering sustainable practices that harmonize with our nature. Let me share an interesting control instrument which we collaborated with the Agriculture Fisheries and Conservation Department (AFCD). Sometimes, innovative idea doesn't always have to be ground-breaking; the simplest ideas may make big changes.

The AFCD raised concern overs the Golden Apple Snails (福壽螺), one of the Top 100 "World's Worst Invasive Alien Species". This snail damages wetland ecosystems. To tackle with this, EMSD has developed a customized floating robot that utilizes AI image recognition to accurately identify Golden Apple Snail eggs, that's those small pink eggs as you can see on the grasses, and get rid of these eggs using high-pressure water jets and a swinging stick. This approach is not only effective but also environmentally friendly. By avoiding the use of chemicals, we ensure that our solution aligns with sustainable practices. The influence of green sand enriches our ecosystem, infusing it with vibrancy and vitality.

The three projects that I just shared with you had all obtained awards and recognitions by the 49th International Exhibition of Inventions in Geneva last month. I am delighted to share with our CAI fellows here that the Hong Kong, China Delegation was awarded a record-high number of more than 350 prizes[1] in this year's Exhibition.

Facilitation and Collaborations

From these examples, we can see that our sand art bottle has a solid foundation with layers of coloured sand, thanks to the contribution and efforts from all stakeholders. To continue crafting the sand art of innovation, EMSD has embraced the pivoting role of "Innovation Facilitator". The E&M InnoPortal is one of the initiatives to facilitate. We bridge the gap between service needs and innovative solutions, fostering a synergy between government departments, public organizations, the E&M trades, and the I&T sector.

Following the success of the Global AI Challenge for Building E&M Facilities in 2021, we inaugurated the E&M AI Lab to continue the teams' momentum. It stands not merely as a repository of data and AI hub but also as a collaborative platform — just like today's summit, to share, to inspire and to work together, as we can imagine the bottle of sand art that calls together stakeholders from government, industry, academia, and research institutes across the Greater Bay Area and beyond which propels our Innovation & Technology developments forward.

[1]Additionally, six nos. of universities from Hong Kong have received a total of 199 awards further emphasizing their dedication to excellence in education and research, and showing their commitment to pushing the boundaries of knowledge.

Our aspirations reach further, to have synergy with the visionary National policy to develop the Greater Bay Area. In pursuit of closer partnership within the GBA, EMSD has established Memoranda of Cooperation (MoC) with institutions from Guangdong Province in 2023. These agreements, particularly the recent one focusing on green intelligent technology and AI standards for E&M systems in buildings, are not just signatures on paper, they are the embodiment of our shared commitment to a sustainable and intelligent future.

Encourage

The creation of an epochal masterpiece of sand art requires support and contributions from all stakeholders. I hereby invite our CAI fellows to bring your colours of sand to this collective endeavor. We blend the diverse colours of our skills and ideas to create a colourful future for the CAI field and beyond.

Xiaomi EV

A rough mix of grains of sand is merely an art. Strategic refinement and layering by harmonious collaboration will forge a masterpiece with much greater value. The Xiaomi Electric Vehicle production line is a very good example that showcases this idea. It is a marvel of modern engineering, standing as a perfect demonstration to what can be achieved when instruments, control systems, and automation processes synchronize with artificial intelligence perfectly. Let’s watch a short introductory video.

The Xiaomi production line brings together diverse components - sensors, robotics, software, and human expertise - into a cohesive, high-performing system. It's not enough to simply have great individual technologies or ideas. The true power emerges when we strategically integrate these elements, fostering synergies that amplify their impact.

New Quality Productivity Force

An EV rolls off this production line in only 76 seconds, embodying the New Quality Productivity Force. “New” represents the cutting-edge technologies adopted, while “Quality” is ensured through AI-driven quality assessments, enhancing productivity at unprecedented speeds. By facilitating this kind of collaborative innovation, we can unlock unprecedented capabilities and efficiencies. Just like a breathtaking masterpiece that arises when individual grains of sand find the perfect places to come together. The sum is greater than the parts - no doubt that the transformative potential of harmonized, interconnected systems, will propel industries forward and sets new benchmarks for quality and efficiency.

Closing

In conclusion, I extend my heartfelt gratitude to the organizing committee for their vision. Let us join hands in collaboration, for it is through our united efforts that we can harness the New Quality Productivity Force to accelerate the development of the future.

Together, we will innovate, we will automate, and we will create our colourful future. Thank you, and may you all find inspiration in our journey ahead.