Guest Editors' Introduction

Implementable Humanitarian Technology

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In the 21st century, humanitarian crises have become very complex in nature and affect huge portions of the global population, not just the marginalized, discriminated, indigenous, and disaster/war hit communities, but also people in so called developed and relatively rich nations. Some of these crises are easily preventable with appropriate technology. For example, the impact of the 2014 tsunami that killed more than 275,000 in 14 countries across two continents could have been much less with a warning system.

Some other issues need long term solutions. At least half of the world's population cannot afford essential health services, according to the 2017 report from the World Health Organization. The biggest concern is the access to health professionals where remote healthcare can be a blessing. The United Nations Food and Agriculture Organization estimates that about 815 million people, or 10.7% of the world population, were suffering from chronic undernourishment in 2016.

Poverty and denial of basic resources leads to suicides. National Crime Records Bureau of India reported that a total 296,438 Indian farmers had committed suicide from 1995 to 2019 due to poverty. Just in 2012, approximately 804,000 people in the world died by suicide due to lack of hope in life. According to the National Institute on Drug Abuse, more than 130 people in the United States die after overdosing on opioids every day, which is another indication of failure in the social system.

The list of heart-breaking statistics of humanitarian issues is very long. These staggering statistics show that large scale, feasible, and implementable measures need to be taken systematically to address these issues. Some, if not all, of these sufferings can be alleviated using the technology.

A Humanitarian Engineer can be a student, academic or professional from multiple disciplinary backgrounds, who harness a concern for global humanitarian crises with their unique expertise and skill. Together they collaboratively research, analyze and engineer holistic, innovative solutions for this issue. The IEEE is recently focusing much needed widespread attention on humanitarian issues. One example is the annual Global Humanitarian Technology Conference, which is followed by many regional conferences such as the IHTC Canada and HTC Sri Lanka.

Also, to contribute to this noble cause, IEEE Consumer Electronics Magazine has issued this Special Section on Implementable Humanitarian Technology. Only three articles were accepted for this Special Section after a very thorough review process. The first article describes a unique

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Internet of Underwater Things that has the potential to empower humanitarian applications in ocean environments, by sensing and transmitting data in the underwater environment where human beings cannot reach. This wireless system can help mitigating disasters, relieving in global warming, and providing access to scientific data.

The second article describes Internet of Things (IoT) and sensing applications in healthcare. IoT can extend its scope by accessing cloud resources while the cloud can enhance its services from the data collected from the healthcare IoTs. Considering the cost and access issues to the cloud services in remote regions, a middleware low-cost technology, namely, the "fog," with limited computing capacity is introduced. This article explains how the fog enables cloud-IoT convergence for a more versatile healthcare solution. Few use cases are presented for more insight.

The third article goes one step further. It describes the implementation of a body area network (BAN) for observing multiple physiological signals from patients. A number of inexpensive wearable sensors such as thermometer, electrocardiography meter, and accelerometer (to detect fall and seizure conditions) were integrated in the BAN, and the data is transmitted to a Wireless Control Unit and then to the cloud. This system enables remotely monitoring patients in real time and the ability to predict impending issues. The developed prototype shows feasibility with highly accuracy signal detection.

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