Keynote Speaker

Development of IoT-wearable Devices for the Purpose of Predicting the Cardiopulmonary Arrest Accident in the Citizens' Marathon Competition

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Abstract

The cardiopulmonary arrest accident at the verge of the large-scale sports special events such as citizens' marathons occurs at 1/50,000-100,000 runners. Though the outbreak frequency is low, the load to hang over the area when a cardiopulmonary arrest accident happened is big. In a risk foresight, electrocardiogram analysis is common, but the outdoors and the use by the sporting event have a limit. It is also unsuitable for the measurement in the outdoors including rainy weather in particular and the simultaneous record and analysis in the group. To solve many technical and environmental problems, we use a smartphone which has built-in a 3-axis gyroscope and a 3-axis accelerometer to measure both respiratory rate variabilities (RRV) and heart rate variabilities (HRV). Our newly proposed Stress-Index (SI) is possible to measure the stress objectively and quantitatively. SI can be derived with a simple expression: $SI = RRV/HRV$. By the analysis of the breathing pattern by machine learning to SI and Body mass index level, one high-risk runner that abnormality was recognized for circulation and breathing after Marathon completion. The possibility that this system was useful for a cardiopulmonary arrest predicting accident in the large-scale special event was suggested. We are now challenging to measure the SI during the human actions using the IoT-wearable devices to make the healthy world Society5.0 without stress and the pain in 2025.