National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: Harnessing Heat: The Role of Thermal Imaging in Human Monitoring
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Venue	: Seminar Room, EE Department
Date and Time	: 29 Aug 2024 (5.30 pm)
Abstract	: Imaging technology has evolved significantly, offering unprecedented insights across diverse domains. This research explores the multifaceted applications and implications of infrared thermography (IRTG) in human healthcare monitoring. IRTG has emerged as a valuable adjunctive tool in healthcare, offering radiation-free and non-invasive insights into physiological processes and psychological conditions through the visualization of surface temperature variations. In clinical diagnostics, thermal imaging enables early detection and monitoring of various conditions, including musculoskeletal injuries, inflammatory disorders, and psychosomatic abnormalities. By capturing thermal patterns associated with tissue perfusion and metabolic activity, thermal imaging aids in differential diagnosis and treatment planning, particularly in specialities such as rheumatology, sports medicine, physical and cognitive fatigue and human emotions. Conventional methods of facial imaging analysis primarily rely on visible light imaging, which is vulnerable to misinterpretation sometimes. Recent advancements in imaging technology have opened new avenues for non-invasive human monitoring by analyzing facial temperature variations using thermal cameras. Thermal images lack the detailed visual information present in images, which can make it harder to identify specific features or subtle expressions. To overcome these problems of both modalities, current research has started focusing on the fusion of visual and thermal images for better feature information called Multi-Spectral Dynamic (MSX) thermal images. As there is no database to detect exercise-induced fatigue, the key area of focus in this study is to generate a novel dataset to identify the region of interest of MSX facial thermal images for the detection of physical fatigue and emotion recognition. In this study, we propose a spontaneous emotion dataset of MSX facial thermal images and employ a standard deep learning-based approach to validate the proposed dataset. This work combines advanced Computer vision and thermal imaging technology that allows the detection of fatigue in the human body and the possibility of making real-time human emotion recognition systems more affordable and portable. We also propose a model for predicting human emotions using our proposed dataset. Our proposed model recognizes emotions with an accuracy of 84.13\%. This outcome indicates the effectiveness of our approach in recognizing and detecting the facial emotion of interest with our proposed dataset. Our experimental results demonstrate the efficacy of our database compared to visual and thermal imaging in accurately recognizing human emotions, showcasing its potential for real-world applications in affective computing, healthcare, and human-computer interaction.