外国語要旨

Evaluation on Lifelog Analysis Application based on Data Quality Evaluation Framework and Proposal of Practical Realization on Cloud Environment.

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In recent years, with the rapid development of small and high technological sensor devices, many types of multimedia sensor data can be collected and converted to develop useful networked multimedia application such as human activity recognition. As a result, various lifelog analysis applications have been developed that offer the user profitable information such as person's action histories with an analysis of collected data by sensor terminals, video cameras, and so on.

There are many past and existing research works focused solely on computer vision and image processing algorithms in terms of their human activity recognition accuracy. However, these research works lack the understanding of end-to-end system characteristics affecting the captured multimedia sensor data quality that will impact the accuracy of human activity recognition. Thus, our objective of this research work is to study and analyze the impact of the quality on the human activity recognition accuracy in the end-to-end multimedia system environment --- Ocha House. Ocha House is a Japanese home setup to conduct cyber-physical system experiments using several multimedia camera sensors to monitor and capture human motions and activity data in an end-to-end wireless multimedia network environment. That is, the collected human motions and activity data in Ocha House are transmitted real time over the WLAN to a server for processing and analysis in human activity recognition application.

The purpose of this study is to evaluate the impact caused by the quality of input data to lifelog analysis applications with quantitative indicators. We suppose a typical human activity recognition system of which the input data is video image, acceleration data, and sound data collected in a sensor space, and it provides users the result of analysis by applying some theoretical data processing to the input data. The data quality evaluation experiments have been executed to know how the difference of input data quality results in the output of the application. For example, while only a small number of frame drops or little noise will hardly influence the result of the human activity recognition system, if there are a lot of dropped frames or noise, the application would not be able to output the correct results. Therefore, it is important to clarify the quantitative indicators to show which level of data quality is required for the application to work correctly.

In the data quality evaluation experiment A, the image data and acceleration data is the input data, and the frames rate is artificially varied from 10 frame to one frame / sec. We have shown the correlation between input data frame quality and the accuracy of the system.

In the data quality evaluation experiment B, we have utilized following four kinds of image data: "blurred image", "vertical to the blurred image", "next to blurred image", and "resolution degraded image". We have shown the correlation between input image quality and the accuracy of the system.

In experiment C, we have implemented this human activity recognition system and experimented the impact of the WLAN communication quality on the human activity recognition accuracy in the end-to-end networked multimedia system environment --- Ocha House. Ocha House is a Japanese home setup to conduct cyber-physical system experiments using several multimedia camera sensors to monitor and capture human motions and activity data in an end-to-end wireless multimedia network environment. That is, the collected human motions and activity data in Ocha House are transmitted real time over the WLAN to a server for processing and analysis in human activity recognition application.

In addition, we have concerned to introduce the Lifelog Analysis Application to each family as abnormal activity detection system inside a smart house. When considering setting up the system in each house, it is effective to collect and analyze the sensor data on Cloud environment. We have also proposed how to implement the system in many houses, and evaluated how to migrate the data quickly and securely.