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Multiple Dynamic Stepping Process Architecture in Wearable Bio-sensing Data Systems

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Abstract. Previous process configuration of biometric information system is performed by the single sequence statically and consistently without changing after the system is running. However, this single static process configuration appears an inefficient performance to the applications of the mobile biometric information system in the wearable computing environment. This work proposes the multiple dynamic process design and execution method as a way to overcome these inefficient processes and to provide different process scenarios.

Keywords: Multiple dynamic process design, wearable bio-sensing, bio-information architecture, human monitoring.

1 Introduction

There is a bioinformatics system, which senses and gathers health conditions and various bio-information of mobile users to set up and utilize medical information. The information devices to monitor the bio-information of mobile users are being diversified and sophisticated according to their used purpose such as wrist type, necklace type, glasses type, garment type and shoe type, etc [2].

As shown in Figure 1, the bio-information sensing architecture gathers the bio sensing information of each individual patient through a personal-type bio-information device while gathering the bio data on such information after configuring a local infrastructure network using wire networks such as LAN and PSTN or wireless networks such as WIFI, Zigbee and Bluetooth as well as transmitting the bio data using an internet interworked network through wire IP network or wireless 3G/4G global network. The wearable devices of Figure 1 show the distributed collection process for supporting multiple sensing. The second or the third steps could support data snapshot, which synchronizes data among different wearable devices such as image-data of glass, signal-data of health patch, healthcare-data of wrist watch, and etc. And, a user can dynamically select the bio-sensing data by his requirements. Also, the role of monitoring and managing the bio-information of each individual user has been performed through personal computer or bio-information server located at the infrastructure network [4]. The sensing information gathered through such mobile bio-information devices configure different information

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processing system depending on the sensing method, transmission channel, storing and filtering process as well as analysis and evaluation method, etc [5].

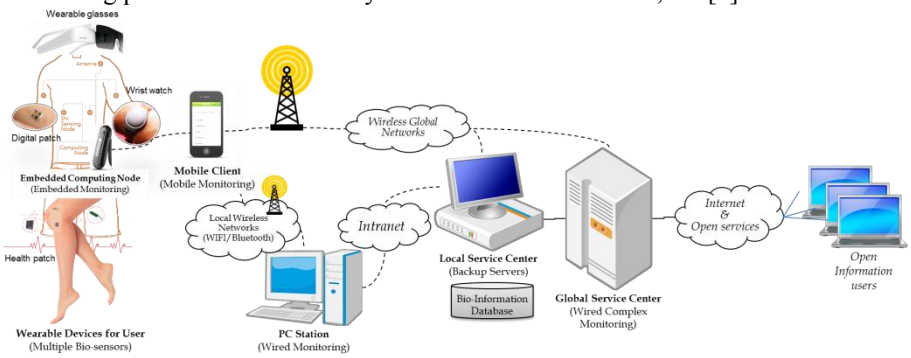

Fig. 1. Wearable multiple sensing architecture for bio-information computing.

The existing bio-information process performs single static and identical process without changes after being defined as default and optional process at the initial stage of system configuration. Such single static process indicates ineffective execution in the application of mobile bio-information system performing mobile computing. Especially, an inconvenient duty of having to perform initialization of new definition and execution is accompanied during the process configuration of bio-information system and change of method. As well as it just supports single process scenario at once for collecting the user required bio-information. This study proposes a multiple dynamic process design and execution method to solve these problems. A selective distributed collection model which bio-data are obtained from multi-sensors within a wearable user performs A distributed transmission scenario of the biometric data based on a distributed system [5][6].

2 Multiple Dynamic Bio-sensing Information Processes

The system bio-information process gathers various bio-information of a patient using piezoelectric sensor and respiration sensor. The bio-information gathered this way gets sampled or transformed as various digital bio-information such as peak information, amplification information, location information or body type information, etc. Such process is called the forward collection process. This interacts with the backward control process such as the clinical trial for controlling and guiding the bio-information devices and the bio-information patients or analysis, evaluation and feedback of gathered health information [1][3].

The form of bio-information transmitted here is the analog signal data or digital conversion code date as raw data. Otherwise, the filtered source bio-information has the characteristics of specific peak data, specific interval data or specific event data.

The sensing information process of bio-information system can be composed of a process scenario such as raw sensing, data transformation, data filtering, data transmission, data saving, data analysis and statistics , etc. as shown in Figure 2. The first wearable sensing devices are configured of multiple sensing devices and

embedded sensing networks with different kinds of biosensors. The second embedded sensing station supports distributed collecting logics and snapshot synchronizations. In the third mobile station, we need to provide the real-time composite-monitoring technology. In the fourth and fifth steps, they provide new methods for analyzing the composite-sensing modules. Moreover, they require the backup and replay synchronization technology that reproduces the specific human monitoring data. The final step can support various bio-information applications.

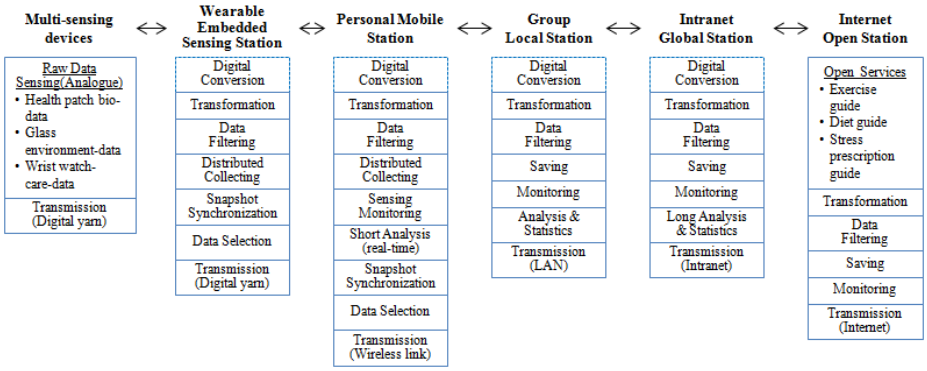

Fig. 2. Multiple sensing bio-information operations.

Figure 2 shows the overall process of bio-information system. Such bio-information process may be executed after being dynamically selected depending on the system configuration environment. The method of selecting dynamic process can be classified as horizontal selection of computing stations and vertical selection of station processes.

First, the horizontal selection is selectively operating the computing station by each stage depending on the necessity of applied environment. As an example, the bio-information system based on the wearable bio-sensing of wireless network environment performs process by selecting the third personal mobile station. In case of the wire based bio-information system, the processes of the third station may be skipped. As another example, the elimination of processes at the open station, which is the last station, becomes required in order to perform an exclusive intranet service. As other example, the instance of connecting a local wireless network at the third personal mobile station selects the fourth local station while the instance of connecting a wireless wide area network performs the process as the fifth global station after skipping the fourth group local station.

Next, the vertical selection is an operation that optionally selecting and disabling some computing processes at the station of each stage to support different event scenarios. More specifically, multiple sensing modules can be selected by user requirements or environmental parameters. For example, the instance of performing digital conversion at the embedded sensing station disables the digital conversation process at the follow-up stations, in other words the mobile station, local station and global station. Then as the sensing data gathered at the first wearable sensing device is sent so that the data filtering process can be performed selectively depending on the application through the second embedded sensing station to the last open station.

3 Conclusions

This paper has proposed a multiple dynamic process design and execution method to overcome the problems followed by static process configuration of bio-information system. This has proposed the basic bio-information sensing architecture and the dynamic process configuration method. Such dynamic process configuration carries an advantage of supporting the adaptability followed by change of system environment such as user environment, bio-information gathering type and method, etc without initialization process or cutoff of system execution while executing the system

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