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AUTOMATIC CONTROL OF HUMAN HEART RATE AND BLOOD PRESSURE USING TILT ABEND MACHANISM

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Abstract:

Prolonged bed rest has significant negative impacts on the human body, particularly on the cardiovascular system. To overcome adverse effects and enhance functional recovery in bedridden patients, the goal is to mobilize patients as early as possible while controlling and stabilizing their cardiovascular system. In this paper, we used a robotic tilt table that allows early mobilization by modulating body inclination and automated leg movement to control the cardiovascular variables heart rate (HR) or systolicor diastolic blood pressures (sBP, dBP). The design and use of a control system is often done with a simulation model of a plant, but the time-variant and nonlinear nature of the cardiovascular system and subject-specific responses to external stimuli makes the modeling and identification challenging. Instead, we implemented an intelligent self-learning fuzzy controller that does not need any prior knowledge about the plant. The controller modulates the body inclination in order to adjust the cardiovascular parameters, withleg movement considered as a perturbing factor to the controller.

Keywords – Systolicor, Fuzzy controller, Intelligent self, Cardiovascular.

1. INTRODUCTION

Now a days global ageing and the prevalence of chronic diseases have become a common concern [1]. Many countries are undergoing hospital restructuring by reducing the number of hospital beds and increasing the proportion of home healthcare [2].

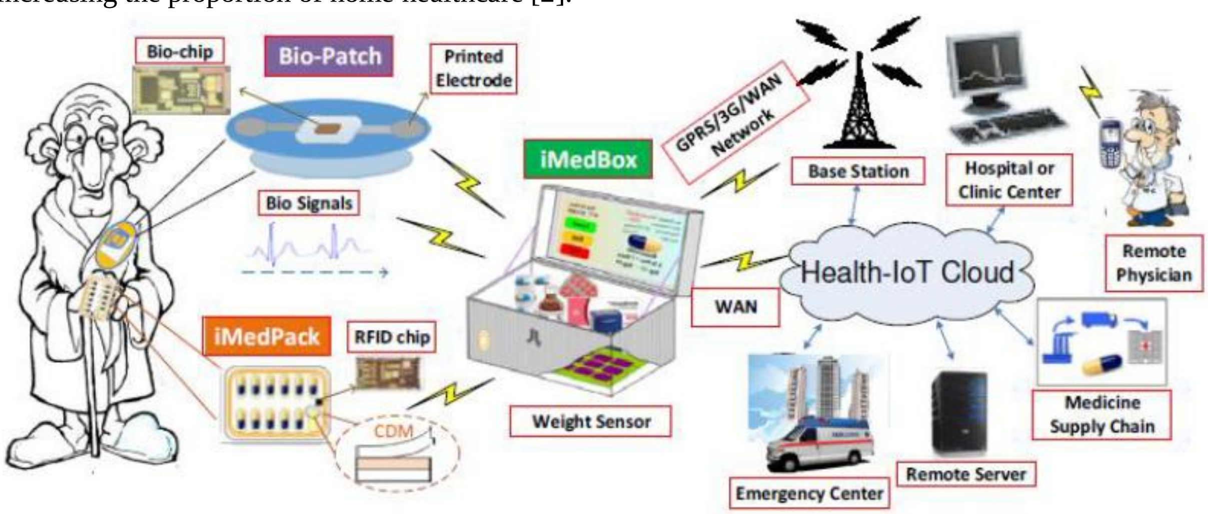


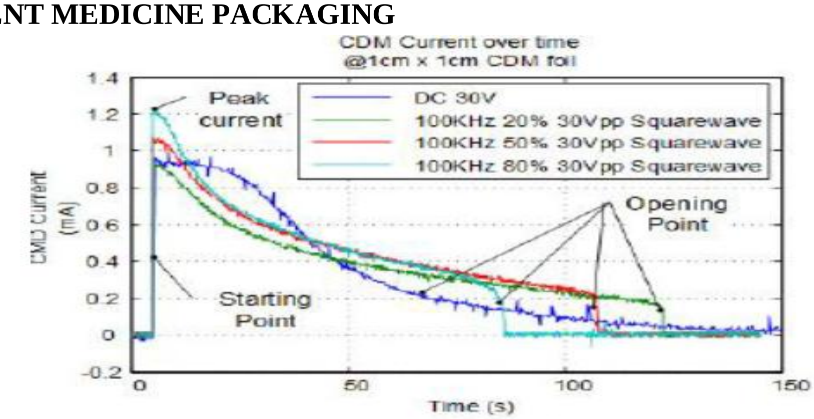
Fig.1. Application scenario for the proposed i-Home Health-IoT system

A promising trend in healthcare is to move routine medical checks and other healthcare services from hospital (Hospital-Centric) to the home environment. By doing so, firstly, the patients can get seamless healthcare at anytime in a comfortable home environment; secondly, society's financial burden could be greatly reduced by remote treatment; thirdly, limited hospital resources can be released for people in need of emergency care, In-home healthcare and services can drastically reduce the total expenditure on medical care or treatment. Telemedicine is defined by the WHO as "the practice of medical care using interactive audiovisual and data communications. This includes the delivery of medical care, diagnosis, consultation and treatment, as well as health education and the transfer of medical data [1]." In 1906, Wilhelm Einthoven experimented the first telemedicine by transmitting ECG recordings through telephone [2]. They object to such new models of working, especially when real time physiology data from patient is seriously needed but lacking in common video consultation. Real time life data feeding and transmitting in telemedicine must be overcome if telemedicine is to reach its potential. As a new generation information technology, Internet of Things brings telemedicine new chance, which applies sensors and network to traditional medical devices, therefore is able to assign the intelligence to them, implement deeper communication and interaction between patients and remote specialists.

2. BODY HEALTH IOT SYSTEM

They can inspect the medication history as well as the physiological status history of a specific patient, make further analysis of a suspicious portion of patient's bio-signals (e.g., ECG) and based on that make a new e-prescription accordingly. Besides patients' benefit, IOT even helps entire health industry, in which wide scope of medical devices are connected to existing health network, patient crucial life signal is captured by sensors and transmitted to remote medical centre, and doctor is able to remotely monitor patient condition, provide medical suggestion and aiding. On the whole, the above-mentioned systems focus either on making improvements to a specific condition or developing devices for a specific problem, which only covers some limited aspects of home healthcare. A comprehensive solution for in- home healthcare is still missing. A desirable system should be capable of taking care of the patients from all aspects, covering personalized medication, vital signs monitoring, in-site diagnosis and interaction with remote physicians. Also, the doctors can perform an overall examination of a patient group by using dedicated software which automatically analyzes the variation of an individual patient's physical condition over a period of time, for example, one week or one month. Subsequently, the doctors can easily identify the patient group whose health conditions have improved, and make them aware of their progress.

3. INTELLIGENT MEDICINE PACKAGING



Fg.2.The delamination current waveform

Nowadays, for senior citizens and patients with chronic diseases, it is critical to follow the doctors' advice. An intelligent medication administration system is desirable to timely remind and dispense the medicine to individuals, and in the meantime, register and track their medication history. Prescribing clinicians frequently do not often detect or ask about non-compliance and are not always good at recognizing when patients stop taking their medication. If possible, it is important to maintain routine contact with the doctor to discuss, among other things, compliance issues. However, this is not as easy as it sounds. Moreover, the misuse and abuse of prescription medication can cause a range of adverse drug reactions, sometimes even leading to de- manufacturing industries, logistics providers, supply chain management, retail outlets, banks, location tracking and process detection. Due to the low-power consumption, quick response, and electrically- controlled delamination features, we combined CDM into an aluminum foil covered capsule package.

4. WORKING PRINCIPLE

In particular for premature heart attacks, a very high proportion of lethal attacks happen during sleep or daily activities. The sooner the symptom is detected, the earlier medical treatment and the In this federated framework, MCAP means Multichannel Adaptation Protocol, HDP refers to Health Device Protocol, L2CAP presents Logical Link Control and Adaptation Protocol.

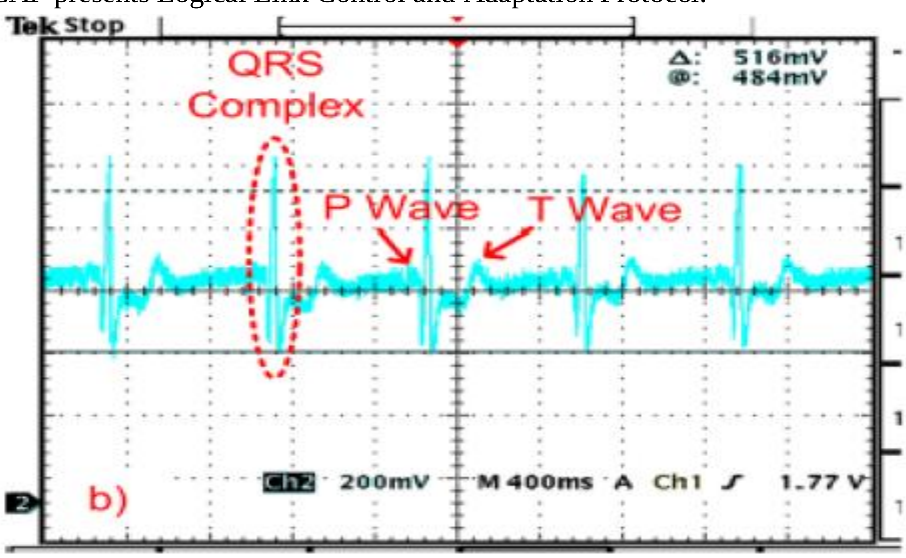


Fig.3. Miniaturized Bio-Patch for single-channel

HCI is Host Controller Interface, SDP stands for Service Discovery Protocol, they all belong to Bluetooth medical/health device standard. Among them, MCAP and L2CAP guarantee robust connection, support retransmit model, streaming model and interoperability requirement definition, while HDP provides Bluetooth application framework. The iMedPack is sealed by CDM and integrated with an RFID tag as introduced in the previous section. The medicines are kept in the iMedBox just as in a normal in- home medication unit. The iMedBox recognizes and registers the medicine information by the RFID number, and meanwhile, compares the medicine with the prescription. We thereby substituted the original single-layer adhesive aluminum layer with a sandwich-structured CDM to seal the packages. Combined with advanced RFID technology, an iMedPack was implemented. An RFID tag is attached along the edge of the medicine package, and connected to the CDM. The RFID tag is wireless-powered by the reader embedded in the iMedBox. The tag can convert the near-field magnetic wave emitted by the reader into a DC supply, and an integrated charge-pump circuit can boost the DC voltage to around 30 V for CDM opening. The RFID always keeps the charge-pump module shut down until it receives an opening-command issued by the iMedBox.

CONCLUSION

In recent decades, the rapid growing of aging population has been a challenge to global healthcare systems [1]. Many countries have been active in undergoing hospital restructuring through optimizing medical resources and increasing the use of home healthcare . IoT now has been recognized as a revolution in ICT and is expected to be applied to many industrial sectors including healthcare . This paper presents an IoT-based intelligent home-centric healthcare platform (iHome system), which seamlessly connects smart sensors attached to human body for physiological monitoring and intelligent pharmaceutical packaging for daily medication management.

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