A Review: Smart Old-Age Home Disease Prediction using IoT and Machine Learning

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Abstract:
In recent years IoT devices has been very beneficial for the healthcare industry, it provides the continuous health monitoring updates which helps to improve the lifestyle of human. This IoT device generates huge amount of data which is store on cloud, so cloud based scenario plays an important role in this rapid changing world. Experts in this field of healthcare sought to robotize the way to identify and treat the diseases that can potentially exploit IT innovation. Today’s enhanced possibilities of the emerging networked environments hold a promise to reduce healthcare costs, workload and occupancy of healthcare facilities by using wireless technologies in providing health services outside the hospital environment. This paper represents a literature review of smart old age homes for people, where a system will work to monitor the health of an individual and generate a report on weekly basis which help to diagnosis them before it is too late. The early diagnosis is always better and this can be archive by using IoT devices, cloud service and machine learning.

Keywords: Smart Old-Age Home, Sensor, Machine Learning, Smart System, Early Detection, Cloud Computing, IoT.

I. INTRODUCTION

Most importantly the purpose of this work is to provide smart home facility so that the elderly one does will get the great experience in their day to day life. The Smart Old-Age home is design to monitor the well being of elderly people. The well being can also be maintained from natural environment, because it helps to reduce stress, helps to attach emotional well being and also recover the people naturally. That’s why it is important to maintain contact with nature. The priority of the elderly peoples experience in a residence should take into account for their fundamental needs and the resulting benefits. The purpose of this study is to suggest the smart home technologies and provide a framework which contains smart home services which can diagnose the elderly on daily basis [1]. Now a day's 18+ adults are having at least one chronic disease, which may cause serious when they will be in their elderly stage or after 60’S.

These chronic diseases are the beginning of serious disease which will happen in elderly age, and in this elderly age it is difficult to cure it from the roots. We can only treat it at the extent where it can be controlled, just like adults take the pain killer for some chronic disease just for relief, without thinking to remove it from the root. That’s why the elderly may require the frequent or immediate treatment otherwise it may result in fatal consequences. And to avoid such emergency situation there should be a continuous fashion physiological monitoring system which helps to monitor the health related parameter.

Most emergency elderly cases seek in patient care, which is very expensive due to the long stay in hospital and have to face the financial burden too. Since we are concerning specially for old age home this financial burden have to faced by the old age home committee. On the other hand, Remote health monitoring is a smart home platform, which allows people to stay at home, to remain in their own environment and comfortable zone rather than to have an expensive limited hospital space and nurses. Sometime the hospitals environment is also responsible for the patients weakness, because the moral of patient goes so low in that single room of hospital that it may cause more serious health, which cause due to the lost of their own dependency[2]. Hence it is a generous need of people now, to live in a smart home, which provides the facilities for the well being of an elderly.

The smart homes are outfitted with prudent and non-invasive environmental and physiological sensors and actuators that can help to facilitate remote monitoring of the home environment such as temperature, humidity, smoke in the home, as well as some important physiological signs such as heart rate, body temperature, blood pressure and blood oxygen level and some activities of person. This healthcare facility also ensures to remotely communicate with the caregivers, and allows keeping and maintaining the record of the occupants and give advice after tracking complete physiological condition of the occupant[3].

II. LITERATURE REVIEW

The use of IoT-based devices is changing people’s lifestyles, especially in activities which are related to healthcare. In this significance, IoT-based devices can monitor, analyze, diagnose, and contribute to the generation of medical pleading for various health conditions, such as overweight and obesity. For this reason, this topic has become the main focus in recent research [4]. In this work, the author present a review of the state of the art of research involving the IoT in healthcare, particularly with
respect to overweight, obesity, and chronic degenerative
diseases.

Vasquez et al. [5] proposed “mhealth”, a health platform that
contributes to improving child nutrition by monitoring their data
and sends notifications and provide messages based on the
choice of food which is very informative.

InVilallonga et al. [6] presented a study conducted on a group of
obese patients having undergone surgery, who found it very
motivating to observe, easily and quickly, a consistent graphic
representation of their activities. Mun-Lee and Ouyang [7]
presented a study that strive to identify correlations between the
risks of developing certain diseases and used healthcare devices
in reference with IoT.

Zaragozá et al. [8] presented a platform has been provided to use
intercommunicated sensors to monitor the activities of children
with their obesity problems. Mun-Lee and Ouyang [9] proposed
a collaboration protocol to send risk notifications to smart
device used in the IoT, along with a new service application
algorithm that was used in devices linked with patients with
blood pressure problems, obesity, and diabetes. Hiremath et al.
[10] proposed a proposal for the conceptualization of wearable
IoT (WIoT) in terms of applications, functions, and design. In
addition, they proposed a system for WIoT that recommends
new directions regarding clinical and operative procedures. Likewise, Vázquez et al. [11] proposed mobile health
architecture to prevent childhood obesity through healthy eating
suggestions using mobile health notifications.

In addition, they considered messages and notifications for a
healthy diet for adults. Kim et al. [12] presented the iN Touch
mobile application to monitor the daily activities of
underprivileged young people with overweight and obesity who
participated in a health apprenticeship program.

Alloghani et al. [13] presented a mobile application to increase
children’s and parents’ awareness of the consequences of being
overweight and obese while providing information on how to
sustain a healthy and balanced diet. By contrast, Wibisono and
Astawa [14] proposed a web page and a mobile application for
the treatment of weight reduction through machine-to-machine
(M2M) information exchange or communication, in which a
specific proportion of weights was used to achieve a healthy
diet. Dobbins et al. [15] proposed a method to obtain physiological data from devices linked to triaxial accelerometers
and a heart rate monitor, in order to detect physical activity.
Likewise, they evaluated the performance of the classifiers in
relation to the physical activities of the patients. Additionally,
Shin et al. [16] defined a new concept of IoT-learning, with
which a health application was developed using a combination of
the IoT and architecture supported by the IoT. Likewise, they
proposed a patient-focused treatment using IoT-learning to
maintain weight.

On the other hand, Aupertit et al. [17] described the design of a
biometric data display board for a childhood obesity camp in
Qatar. The dashboard was validated by a health expert, and the
health status of one patient was evaluated against another
individual from another group to identify activity
recommendations to be improved. Additionally, Yang et al. [18]
presented a study to evaluate the effectiveness of the prevention
of obesity in children 10 to 12 years of age with a mobile
platform system called HAPPY ME, a smartphone application
together with a portable device designed to improve healthy
behaviors to prevent childhood obesity. In addition, Laing et al.
[19] presented a study on the effectiveness of an experimental
intervention based on diet recommendations given by means of a
smart application for weight loss in overweight and obese
patients over 18 years of age.

Ahmed et al. [20] presented an overview of existing health
monitoring systems, taking into account the IoT approach, and
discussed recent trends and the development of health
monitoring systems in terms of health parameters and frameworks, wireless communication, and security issues, while
identifying limitations and advantages.

Mathai et al. [21] presented a scenario-based design approach to
develop new cases for better diabetes management. The
approach identified the patient’s exercise, food, and emotional
habits using mobile devices and sensors. Miah et al. [22]
designed and evaluated an innovative mobile decision support
solution (MDSS) to support the health decisions of rural citizens
and the dissemination of information.

The solution was developed using a design science approach,
allowing general practitioners, based on consultation and
information support, to virtually assess patient conditions and
provide a diagnosis or treatment.

In addition, Lim et al. [23] proposed an unsupervised machine
learning model that has the ability to identify latent infectious
diseases in the real world by extracting data from social media.
Likewise, de Ramón-Fernández et al. [24] presented an
integrative architecture that addresses the various deficiencies of
current systems in terms of security, scalability, integration,
flexibility, interoperability or data standardization to monitor
hypertensive patients.

Jeong et al. [25] proposed the development of IoT
HEALTHCARE, describing its architecture as a smart
alternative for healthcare. IoTHEALTHCARE used sensors
connected to a network to collect medical variables; later, the
data were analyzed through algorithms validated by health
personnel to generate recommendations.

By contrast, Gupta et al. [26] proposed architecture supported by
embedded sensors in the equipment, avoiding the use of
wearable sensors or smartphone sensors, with the purpose of
safeguarding basic health-related medical information. Chen et
al. [27] proposed smart clothes, which, in combination with
innovative procedures in clothes manufacturing, are used to
monitor health status. In addition, Jung [28] proposed a
framework to perform a context analysis of health parameters
collected by WiIoT devices that make it possible to monitor
patients’ health.

Santos et al. [29] presented a mobile gateway supported by the
IoT and used in various cases directly related to m-Healthcare
(mobile health).
III. PROPOSED METHODOLOGY

The proposed technique is broadly categories into three parts i.e. Hardware based, software based and cloud computing for Machine learning processing.

1. Hardware Part
In the Hardware module first the processing unit collects sensor data from different nodes, after processing data it fires restful API to the Amazon web services where all the data stores on the cloud, Hardware is powered by low electric consumption of 5Volts. Different sensors will be attached to the processing unit which consist of ECG Sensor, heartbeat sensor, blood pressure sensor and other essentials sensors required for the old age home in day to day life.

Flow for Hardware unit:
1. Collecting data from sensor nodes, using sensor breakout board.
2. After successfully collecting data it sends to the cloud server for the further processing using restful API.

2. Software Part
The main aim of this proposed system is to provide the automated system to the old age home people and to the doctors in which doctors can monitor daily ECG, BP reports and weekly graphical reports as well as it will automatically sends emergency notification to the doctors and hospitals in case of emergency. Again a dedicated app to the old age home people for the automation of old age home

Objective unit for Software:
1. Firstly, the Doctors can easily monitor old age home patients weekly and daily records track.
2. Doctors will get emergency notification from old age home in case of emergency.
3. An automated system provided to the old age home patients for automation of old age home

3. Cloud Processing Part
In the Cloud processing, Machine learning implemented it will take the weekly data sets of patients and normal old age person and predict any occurrence of disease with that data sets, it will help the old age peoples to track their health problem as well as to the doctors.

Flow for Cloud Processing:
1. Collecting data from Hardware unit using restful API call.
2. After successfully collecting data, Machine learning algorithm process that data with different datasets to find out any occurrence of disease.

IV. CONCLUSION
Smart old-age home services consist of sensors, controllers, actuators, displays, and other smart devices and systems as a network, enabling the localization and remote control of domestic environments as well as automation. The home
network gathers and stores data transmitted from the input device through the home gateway or platform and converts it into a single protocol to deliver it to the output device. Smart-home services for the elderly aim to strengthen physical, mental, and social health management of the elderly and this will be a automated process carried out by using IoT and Machine learning.

V. REFERENCES


[20]. Ahmed, M.U.; Bjorkman, M.; Causevic, A.; Fotouhi, H.; Lindén, M. An Overview on the Internet of Things for Health


