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THE USE OF IOT IN SMART HEALTHCARE OF PATIENTS AND ASSISTED LIVING OF PEOPLE WITH SPECIAL NEEDS

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Abstract

With advancements in technology, medicine has reached great heights and now health can be monitored just sitting at home. In the past few years, there has been a significant increase in the usage of these technologies in our day to day lives which is aimed to improve the standard of living and quality of life among people of all kinds. This research paper consists of several developments, detailed researches and data representation of the use of IoT in healthcare and assisted living, showing how and why there has been a boost in this field.

Keywords: Internet of Things, Smart Healthcare, Assisted Living, use of devices, actuators and sensors.

INTRODUCTION

IoT so called Internet of things is the new technology that has been very popular recently because of its uses in numerous areas including in Healthcare, thus becoming a very essential part of our daily lives. It is a network that consists of physical objects connected to each other (as the name suggests). Using sensors like pulse sensors, oxygen sensors make it so easy to monitor health that there would be no need to visit a doctor for this. It would save on travelling time and most importantly the enormous bills that are needed to be paid to the doctor. During emergency situations, till the patient reaches the hospital, some treatment could be started with the help of such IoT devices. IoT is very robust and reliable, which has certainly made it the need of the hour. But is the increase in use of smart IoT devices greatly responsible in saving lives of patients and increasing life expectancy rates? Let's find out.

Theory

Devices have been specially designed to read the human body with the sensors and actuators they contain, enabling them to recognize their function, share data the obtained and communicating with other devices connected to them. Smart Watches, Fitness bands, Smart Shoes, Artificial Intelligence Devices and several mobile phone applications help to monitor health data and at the same time, they can remind and assist the user to follow the workout routine, exercise regularly, give warnings etc. In these devices, the sensors take in the particular readings and information from the human body like the pulse sensor will take readings of the

pulse rate of that person. This data reading is received in the form of analogue signals and is converted into digital signals by an Analogue to Digital Converter (ADC). These digital signals are understood by the computer as it consists of binary 0s and 1s. The computer processes the data and displays it on a screen like a Smart Watch would display pulse rate on its screen. Devices also use a microprocessor which has been fed with a range of values. If the data read does not fit within the range then an actuator is instructed to take the digital signals, convert them into analogue and send some kind of alert like a buzzer or a notification to the user to take appropriate precautions. Like an oximeter, the microprocessor is fed with a range of 90 to 99 %. If the oxygen concentration goes above or below the same, the user is notified to visit a doctor or take care of themselves. *[1]*

Not only simple devices but more complex equipment used in hospitals including ventilators also use IoT. The process is similar to that described above but only that the actuators can perform much more jobs like increasing oxygen supply if low or turning on electric cardioversion if heart beat becomes irregular or slow. Ventilators are connected to a Local Area Network within the hospital along with some automation that allows them to be controlled remotely which is important in cases of emergency, the patient may die until the doctor reaches to his/her ward but controlling the ventilator from far away may help the patient survive until the doctor reaches to continue further treatment. These are just some examples where IoT is used in the field of medicine, the list goes endless and more developments are being continuously made to make these systems more reliable.

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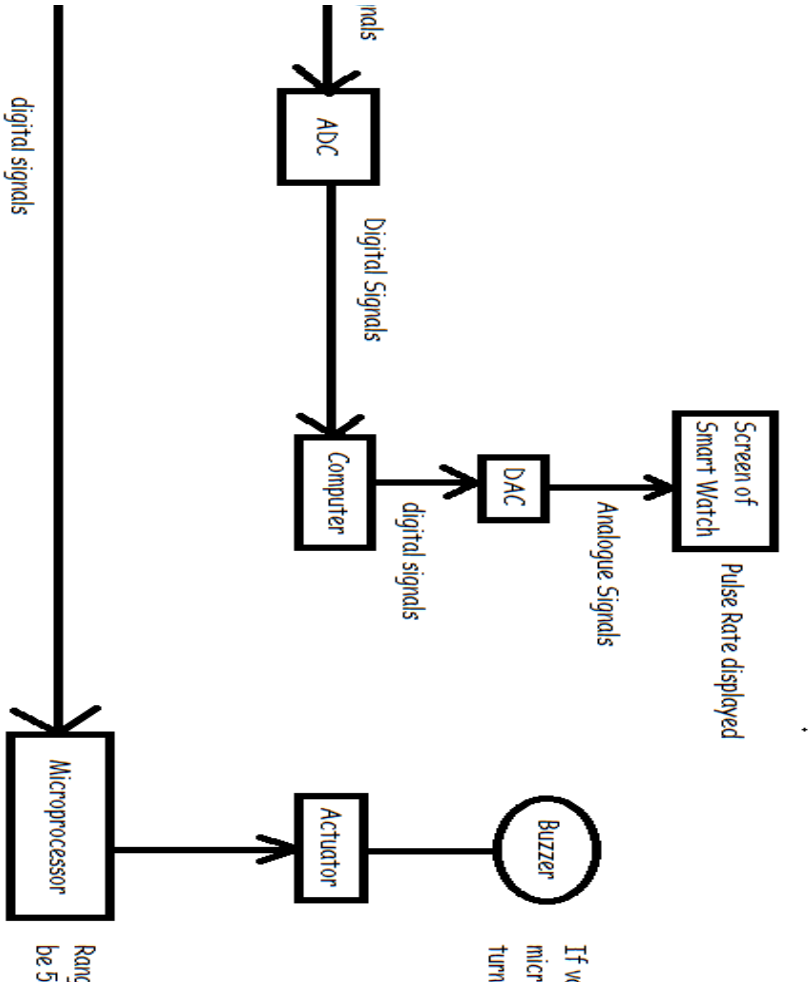

[2]

Experimental

The use of IoT in this field has seen a rise since the past few years. The amount of money spent by organisations to invest in building such devices and the amount spent by people to these devices has also increased. The most likely reasons are the usefulness and need of such technology. Increase in production of these products and increase in income of people has made it possible for people to afford them and ensure their safety. Several surveys and researches were carried out regarding the increase of the use of IoT and increase in sales. The Institute of Electrical and Electronics Engineers (IEEE) *[3]* has scheduled many conferences and undertaken surveys in the last 3 years to discuss on this topic. The online survey cloud based software, Survey Monkey *[4]*, had conducted an e-survey form based on the increase in use of IoT Healthcare devices. It includes questions that will help to know how much common people are aware of this kind of technology and how often they use them in their daily lives. (The link of the survey is mentioned in references)*[5]* This will help collect information related to the demand of such devices in the market. The data set collected showcases that the market size of IoT in healthcare has increased from USD 57.62 billion in the year 2019 to USD 72.5 billion in 2020. It is expected to grow at an even higher rate and will probably reach $188.2 billion in 2025 and $352.8 billion in 2027. *[6]*

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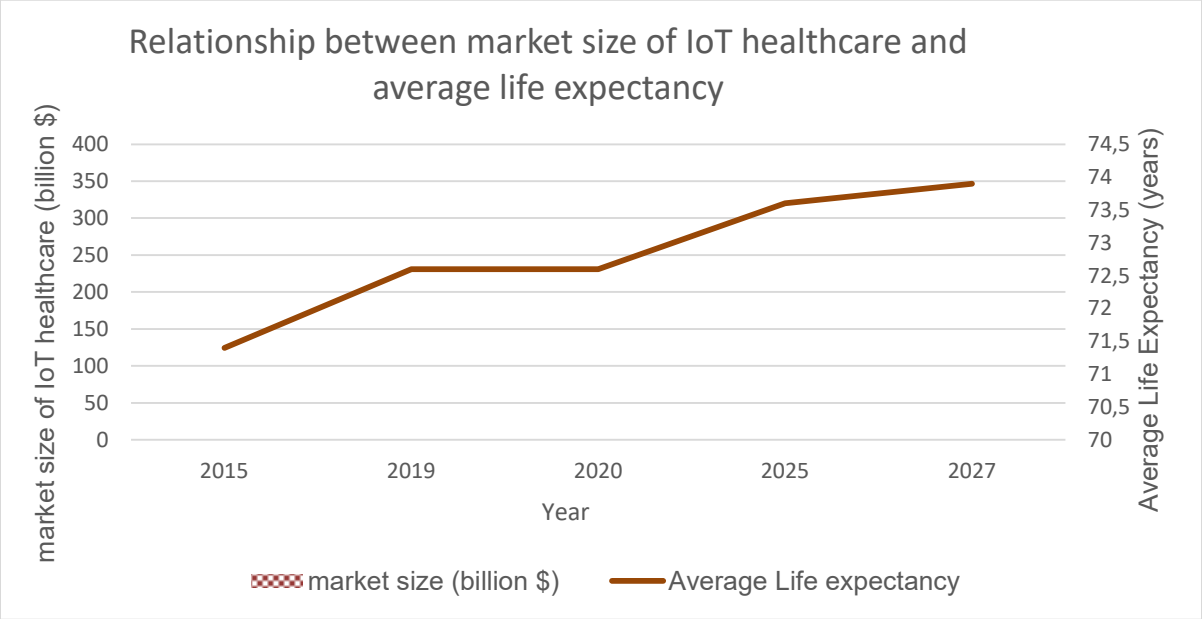
RESULT

From these surveys it has been known that the market size and usage of IoT in healthcare will continue to grow rapidly. However, it is also seen that over the last few years, the average life expectancy of people has seen a rising trend and is predicted to rise even more in the future. Worldwide life expectancy has increased from 71.4 years in 2015 to 72.6 years in 2019 and is projected to go up to 74 by 2030. *[7]* After many researches took place, it is now understood that the advancements in IoT are leading to people living longer lives. The Survey Monkey survey form indeed concluded to show that people are becoming more aware and dependent on such medical devices. Trends show that people who filled the form during the Covid-19 pandemic had more knowledge about smart devices than those who filled the form before the pandemic. Staying healthy and immune to keep away from catching the virus forced people to gain knowledge and invest in health monitoring equipment. Increase of the use of IoT in healthcare has indeed helped save lives of critical patients and made people more careful for their health.

DISCUSSION



[8]

This graph above clearly shows the relationship between the market size of the use of IoT in healthcare and the average life expectancy of the world. As the investment amount increases,

more people are benefitted from the same and it helps them to stay fit and healthy for longer. Detailed relationship is maintained which is evident between the years 2019 and 2020. Because of the Covid-19 pandemic, there were great increase in the number of deaths worldwide, which did not allow the life expectancy to rise. It was a period of global recession and so major investments could not be made into the field of IoT even though healthcare was required during this tough time.

CONCLUSION

To sum up, the use of IoT in healthcare allows fast, efficient and reliable health monitoring that saves doctor visits and expenses of the same. In hospitals, patients can be given remote and personalised treatments. However, some of the disadvantages are too important to be ignored. One of the most dangerous of them is privacy and security of the user. These devices can collect or steal user data and leak it to their company or sell it to someone else. Another major factor affecting the use of IoT is internet connection. Devices need to be connected to the internet or Bluetooth at all times and poor connection would lead to inaccurate results. Bugs or Viruses into the system will make it potentially corrupt and unable to track the patient's health. Moreover, making the user or hospital staff computer literate and teaching them to use the equipment properly would be both time consuming and expensive. Like there are two sides of a coin, IoT healthcare also has several advantages and disadvantages. There are continuous approaches being made in order to minimise the effects of these drawbacks. User privacy controls are being initiated, devices made more user friendly and that work effectively even with low connection.
Internet of Things is a vast field and is expanding at a tremendous rate. The near future will be dependent on IoT for all kinds of tasks it can perform. Everyone should use IoT for the benefits it offers to its users but at the same time, taking care that appropriate measures are taken to avoid the negative impacts caused while using these devices.

Acknowledgements
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