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AI Stroke Detection and Emergency Response System

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***Abstract*— Deaths caused by stroke from patients failed to seek help increases. Most of them don't even realize they have a stroke attack in the first place. Before a stroke takes place, an arrythmia of the heartbeat takes place beforehand. Detecting that can bring awareness to an individual beforehand and overcome a stroke attack that leads to death. This research paper has the aim to propose an AI device that immediately alerts the medical authorities before a stroke attack takes place. For the target population, mainly consists of Vascular Neurologists, patients that went through stroke attacks and Telemedicine engineers. The population will be sampled using stratified sampling and dividing them into subgroups. Besides, the data collection method used is the survey approach. In conclusion, it is possible that AI Stroke Detection system which is wearable can be used in telemedicine to provide real-time monitoring and healthcare. For future recommendations, special optimized healthcare plans can be implemented in the system to suggest the patients to change their current lifestyle to a healthy one depending on their medical background.**

***Keywords*— Stroke, Telemedicine, Artificial Intelligence**

1. Introduction

In this era of globalization, death is a very common thing among the population. One of the heart-breaking deaths is from stroke attacks. Every 3.5 minutes, someone dies of stroke and every 40 seconds someone gets stroke [1]. How heartbreaking it is yet many people fail to understand the impact that stroke is making. Research conducted [2], states that if individuals follow a healthy lifestyle, the chance of getting a stroke is 80% lower than those who do not follow a healthy lifestyle. This paper is all about a solution to taking premeasures to prevent severity level of helpless death due to stroke.

2. Materials and Methods

2.1. Identify Target User

The target users for this research would mainly consists of Vascular Neurologists, patients that went through stroke attacks and Telemedicine engineers. They were chosen cause because they would contribute a lot in coming up with the device that detects stroke attacks even before they arise, enough to reduce the number of deaths that is caused by stroke attacks [25].

2.2. Sampling Method

For the sampling method, the stratified sampling method was used in this research to cover a vast number of respondents in a short time that have a known non-zero chance of getting selected due to the fact that it's a random selection. In addition to that, it also prevents bias among the respondents. The population will be divided into different subgroups and then selecting the subject from each group in an equal manner [26].

2.3. Sampling Size

The survey that is created will be implemented with 200 respondents that consists of doctors, stroke patients and telemedicine engineers. So that the voices can be represented equally in each divided subgroup.

2.4. Data Collection Method

As stated above, the data collection method that was chosen was surveys. The reason is to obtain data from many respondents in a limited time frame. In addition to that, the questions created in the survey are very straightforward and easy to understand due to the fact that the respondents vary from different age groups and backgrounds.

The contents of the survey will include 5 multiple choice questions, 3 open ended questions and 2 Likert scales questions. The questions will be created by adapting some questions from various surveys and the rest will be created based on the needs of the research. Before the questions are given out, a pilot test of the questions will be taken place to know and evaluate the quality of the questions of the survey.

Once Data is collected from the respondents, the data will now be analyzed to contribute to the feasibility of telemedicine and how it benefits stroke patients in preventing deaths.

3. Conclusions

Artificial Intelligence in the use of telemedicine is still under development in the healthcare world. Furthermore, connecting it with the ability to detect Atrial Fibrillation to prevent Stroke attacks beforehand hasn't been come into consideration despite no studies have proven the effectiveness of this fusion. In this research paper, the feasibility study of detecting stroke beforehand by detecting the possibility of Atrial Fibrillation using AI and telemedicine and if detected, reaching out to the emergency authorities for help will change the lives of many patients by reducing the possibility of getting stroke and will benefit the medical organization by speeding the process of diagnosis in an easy and effective manner. This will open a start for researchers to further develop this system created in the future. Medicine and Technology will continue to emerge steadily over the years.

Figures

Apple Watch Detection

Apple Watch Fall Detection is a feature available in Apple Watch SE or Apple Watch Series 4 and above. The Apple watch has two functions in fall detection. It detects whether the user had a fall and alerts the emergency authorities. Here is how it works. When the user had a fall or the user is still at one place while the watch is on for about one minute, it starts a countdown of 30 seconds. During this 30 second, it taps the wrist of the user and releases a warning alarm. As time goes by, the alarm gets louder so that the user will wake up to the sound or someone nearby can hear it. In between this countdown, the user can click cancel if not after 30 seconds, the apple watch will contact emergency services and inform the users status and location [21].

Figure 2: Apple Watch Fall Detection Interface

Figure 2 above shows the interface inside the Apple Watch that appears when one is suspected of immobility. The user has an option of responding to an SOS call or the "I'm OK" option to stop the 30 seconds countdown before Apple Watch automatically calls the emergency authorities.

Kardia Mobile

AliveCor's KardiaMobile is an electrocardiogram (ECG) which is compatible with Smartphones for data collection and analysis that helps to detect Atrial Fibrillation from the comfort of your home [22]. Most mobile devices can accommodate the KardiaMobile ECG. To capture an ECG, it just sits on the user's fingertips or chest. Electrical impulses from the user's fingers are converted into ultrasonic signals and delivered to the mobile device's microphone using AliveCor's patented technology.

Figure 1: Apple Watch Device

Figure 3: ECG Patch Monitor and Interface

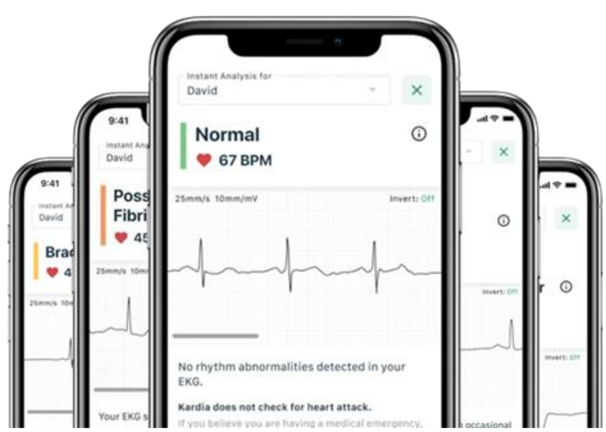

Figure 4: App Report Interface

Figure 3 above shows the ECG monitor that is connected to the smartphone collecting data from the fingertips and transmitting them to the smartphone for a visual interpretation of the heartbeats. Figure 4 shows the types of states the app will show to alert the user of a possible Atrial Fibrillation for example.

Overview of Proposed System

Below Figure 5 explains the four main functions of the system. The system monitors the heartbeat of the patient. The System then detects any possible Atrial Fibrillation through the arrythmia pattern of the heartbeat. If there is an Atrial Fibrillation detected, the system then calls the emergency authorities for help together with sending the location of the patient. The Emergency Authorities will then be on call with the patient and advise them of the steps necessary to take while the emergency team arrives at the location with an ambulance.

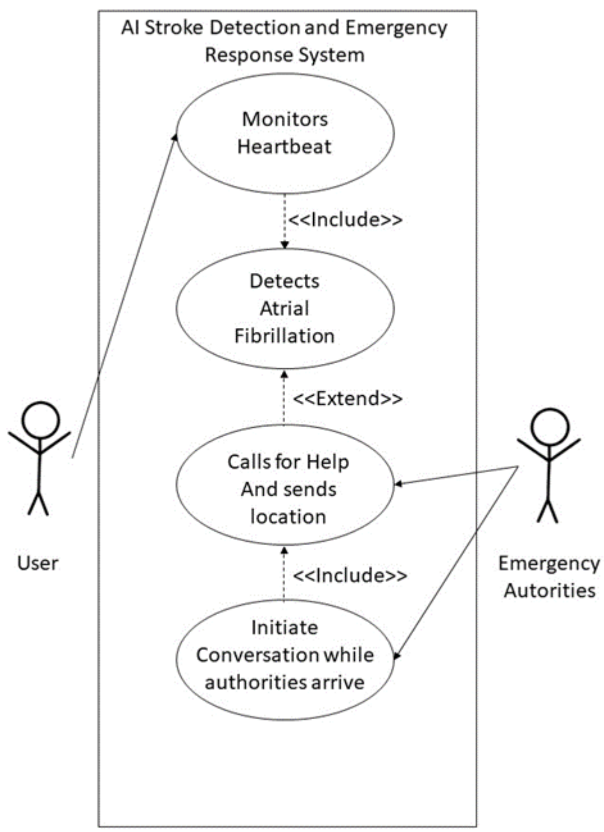

Figure 5: Use Case Diagram for the AI Stroke Detection and Emergency Response System

Tables

Similar Features /Component	Apple Watch	KardiaMobile
Telemedicine	✓	
Artificial Intelligence	✓	✓
Wearable	✓	
Smartphone Connected	✓	✓
Price	Affordable	High
FDA Approved	✓	✓
Detects Atrial Fibrillation		✓

Table 1: Comparison Table between Apple Watch and Kardia Mobile

Table 1 above shows all the features and components for the similar systems discussed earlier. The features that are compared are Telemedicine, Artificial Intelligence, Wearable, Smartphone Connected, Price, FDA Approved and whether it detects Atrial Fibrillation.

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