Monitoring a Pregnancy at Home

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Abstract: It has become obvious in recent years that mobile computing was developed to increase both storage capacity and processing performance. One of the many data ways that can be applied to mobile computing is the integration of healthcare applications and services. This article suggests a framework for mobile computing-based prenatal healthcare. Pregnancy typically lasts nine months. A pregnancy's three-month intervals are referred to as trimesters. The fetus grows and develops throughout each trimester. Prenatal testing and routine medical exams are crucial. This strategy allows for the daily fetal checkups through mobile computing, integrating all necessary services and removing barriers. You can only access and send data thanks to mobile computing technology. You can only access and transmit data from remote areas without physically being there thanks to mobile computing technologies.

A wide communication coverage diameter is made possible by mobile computer technology. It is among the quickest and most dependable subfields of computing technology It is one of the fastest and most reliable sectors of the computing technology field.

Index Terms: Mobile computing, Healthcare, Communication, Pregnancy. (Key words)

I. INTRODUCTION

Without being connected to a fixed physical link, mobile computing enables the transmission of data, voice, and video via a computer or any other wirelessly capable device. With this technique, data is transmitted wirelessly through mobile phones, computers, and other wireless devices. You can only access and transmit data from remote areas without physically being there. A wide communication coverage diameter is made possible by mobile computer technology. It is among the quickest and most dependable subfields of computing technology. In a mobile computing system, a computer is transported to the field together with all essential equipment, such as data and software. It is a technology that enables one to use a computing device even when they are on the go and moving around. One of the key features of the system is its mobility.

Scientific information that cannot be retrieved by other ways is being gathered via mobile phones in far-flung and secluded locations. The scientists are starting to employ mobile devices and web-based programs to carefully study fascinating scientific elements of their surroundings, ranging from The medical sector has never been among the leaders in information technology and computing whether it comes to patient care or clinical trials. In both Europe and the US, this is only partially true. The same is true for mobile computing. The IT industry's technological advancements have been slow to reach the medical sector. Contrary to widespread medical advancements, which in many sectors IT usage is not prioritized since the world is developing quickly. Evidently, the industries that have benefited financially from embracing the internet and mobile computing are the ones that have been establishing industry standards. Given the recent explosion in smartphone technology and the widespread adoption of mobile and wireless networks, it is clear that wireless infrastructure can serve a wide range of existing and future healthcare applications. Consider a doctor who has just treated a patient impatiently as an illustration. At the patient's bedside, the clinician could write a description of the service in a paper record. As an alternative, the physician can just enter some service parameters into a mobile device. Wireless networks are used to automatically transmit the entered data to the billing systems. Another intriguing use would be to write a prescription on a mobile device that sends the order to the right pharmacist via the internet.

Fetal heart rate monitoring measures the heart rate and rhythm of your baby (fetus). This lets your healthcare provider see how your baby is doing [2]. Fetal monitoring is a crucial aspect of a medical investigation of health concern during pregnancy.

A specific hospital is in charge of keeping track of pregnant women to safeguard the mother’s and fetus health throughout the pregnancy period. The introduction of telecommunications technologies into the healthcare setting has improved patient access to healthcare practitioners, processing speed, and service quality. In addition to potentially boosting patient care in both urban and rural settings, present and upcoming wireless technologies help relieve stress from healthcare professionals, enhance their retention, productivity, and quality of life, and lower the overall cost of healthcare services. We develop a novel wearable fetal electrocardiogram (fECG) monitoring system consisting of an abdominal patch that communicates with a smart device. The system has two main components: the fetal patch and the monitoring app [3].

Fig.1 Transformation of Data through mobile computing in healthcare

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II. PROBLEM DEFINITION

The current social insurance system checks pregnant women who remain at home during the days after delivery or before delivery either through an overseer or a medical caretaker. Continuous monitoring might not be possible with this technology because anything can change in a person's well-being parameters in a matter of seconds, and if a guardian or attendant is not present, more significant injury can result. Therefore, in this newly developed era when the world wide web is administered, there is a need to add to another intense framework for health awareness where regular checks are made on pregnant women.

Constant health monitoring is crucial for pregnant women as well as the fetus or newborn baby. In rare cases, both in rural and urban locations, a fetus may pass away inside the womb and the parents will learn about it after a few hours. In remote locations, the lack of continuous monitoring of the fetus puts both the mother and the fetus in danger. Cardiovascular disease (CVD) is still the largest cause of maternal death, and it can be difficult to diagnose clinically in pregnant women. In order to check for maternal and fetal risk, pregnant women with known heart disease require comprehensive multidisciplinary management by obstetric and medical teams.. The most crucial clinical technique for identifying and treating cardiac problems during pregnancy for both the mother and fetus is electrocardiogram.

III. PROPOSED SYSTEM

Monitoring fetal heartbeat is a way to determine the well-being of the fetus. Obstetricians monitor fetal heartbeat practically in every pregnancy [4]. This allows them to check the wellbeing of the fetus and look for any change that could be connected with pregnancy or labor-related problems.

For high-risk pregnancies, fetal heartbeat monitoring is frequently employed. In the case of female patients with disorders like:

A. Diabetes

B. High blood pressure

C. Obstacles to fetal growth

If the fetus' heart rate is abnormal, it may indicate that it is not receiving enough oxygen or that there are other issues. During pregnancy and childbirth, the doctor can make sure the fetus is healthy by keeping an eye on the heartbeat.

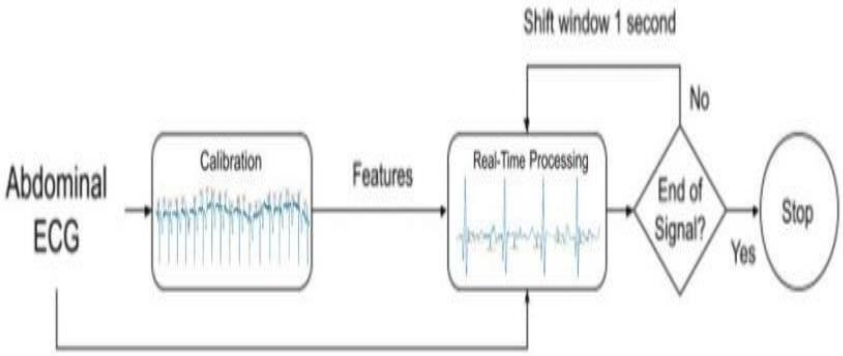
Although being pregnant is a joyful time for the parents, it can also need numerous visits to the doctor's office to track the fetus's health. Currently, an ultrasound test is the most popular way to keep track of a fetus's heartbeat; nevertheless, this procedure necessitates not only a trip to the doctor's office but also the skills of a skilled technician.

Researchers have created a novel system that combines a wearable gadget, a smartphone, and an algorithm that could provide at-home monitoring of a fetus's cardiac health in their search for a more straightforward way. The newly developed algorithm, Lullaby. The University of California, Irvine and researchers have partnered to create a revolutionary fetal cardiac-monitoring device that makes use of the Lullaby algorithm, which is covered by a provisional joint patent. Sensoriis is the supporting firm.

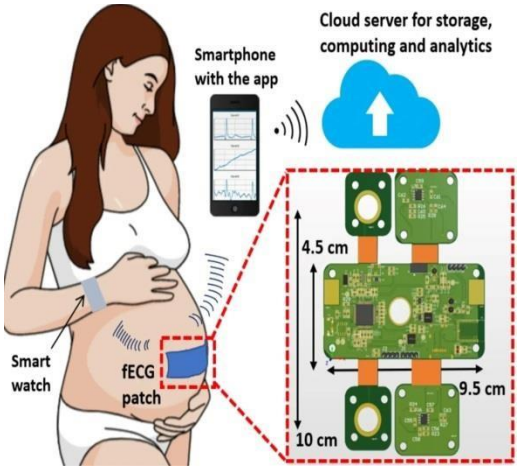
IV. WORKING

The wearable gadget includes electrodes that track the electrocardiogram (ECG) signals from the fetus as well as a patch that is applied to the user's abdomen during pregnancy. The gadget also has a microprocessor that interprets the impulses and transfers them wirelessly to a watch or smartphone. The data is then accessible to users via an app. However, a significant issue with this kind of technology is the amount of data processing required by continuous ECG monitoring, which has made real-time monitoring with wearable technology difficult. The brand-new Lullaby algorithm deals with this problem.

According to Daniel Jilani, an undergraduate researcher at the University of California, Irvine, who co-led the development of this technology, "Lullaby was made to push the boundaries of the field by creating an algorithm that could process highresolution ECG in real time and on a wearable device." The mechanism takes advantage of the consistent rhythm that a heartbeat needs to function. The device concentrates its processing capacity more on the heartbeats itself than the cardiac activity in between heartbeats by leveraging this temporal pattern to distinguish between true and false heartbeats. The amount of computing needed to process the data and extract the fetal heartbeats is decreased by using this method. This results in more up to date and accurate diagnoses, which ultimately improve patient’s health problems.



The Lullaby algorithm is separated into two main parts: the 12 second calibration window and the real-time processing which continues until the signal is finished. In the calibration phase, the first 12 seconds of the abdominal ECG are used to determine the features of the fetal peaks to selectively choose candidate peaks in the real-time processing phase. In the real-time processing phase, the abdominal ECG is segmented into 4 second windows and processed to determine the position of fetal peaks throughout the entire window. However, only the fetal peaks positions in the last 1 second of the 4 second window are outputted. The window then shifts forward in time 1 second and the process repeats until the end of the abdominal ECG is reached .The original algorithm was written in MATLAB and then converted to C code using the compiler provided through MathWorks Inc.



The Lullaby method was compared to other current ECG-processing algorithms in the study using a data set of abdominal ECG records, and it was discovered to be almost seven to 1,000 times faster than these alternatives.

We think the algorithm is power-efficient enough to operate constantly [on a smartphone] for days or weeks, according to Daniel Jilani, undergraduate researcher. The Lullaby method can run on memory-constrained devices like microcontrollers and smart watches because it needs RAM memory on the order of kilobytes.

V. FUTURE WORK

Although the researchers are unsure of how reliable the Lullaby method is in comparison to a conventional ultrasound exam, they do point out that ultrasound equipment is less available, more expensive, and more challenging to use than an ECG. A wearable ECG device can provide more continuous monitoring as a pregnant user goes about their daily activities compared to ultrasound exams, which are performed during a visit to the doctor's office. Jilani points out that this device has the potential to significantly improve populations with limited access to fetal heart monitoring.

Jilani claims that since the team's initial study, the algorithm has already seen significant improvement. It is now both faster and more accurate than the previous version, and the team is trying to integrate it into a whole system. This includes work on a mobile app that can be used on smart phones to support fetal heart monitoring [5].

VI. CONCLUSION

Mobile Computing provides access to technology in the hands and accessibility to information in various areas of utilization such as education, technologies, healthcare, and disaster management [6]. Mobile computing is coming up to date every day in the field of technology and people want to get the information in their hands. In this study, a wearable system that can track a fetus's ECG in real time was suggested. By continuously monitoring the baby heartbeat through the mother's abdomen patches, the suggested system seeks to enhance the effectiveness of the current pregnancy monitoring devices. The suggested method offers a gadget with a microprocessor that interprets the signals and uses Bluetooth to transfer them to a watch or smartphone. The data is then accessible to users via an app. The abdomen ECG signals of a pregnant user are recorded using an electrode patch in this fetal cardiac monitoring system. HERO Laboratory and Sensoriis are working together to build the unique system at the moment. This study has drawn considerable attention to monitoring the fetal ecg without visiting a hospital or medical facility. The areas requirements are kept in mind but the issues like cyber security, meaningful use, and privacy must be given importance whatever the collaboration might be done

VII .REFERENCES

1. https://www.researchgate.net/publication/285089866_Mobile_Computing_The_Emerging_Technology_Sensing_Challenges_and_Applications
2. https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/fetal-heart-monitoring
3. https://pubmed.ncbi.nlm.nih.gov/34892741/
4. Why It Is Important To Monitor Fetal Heartbeat Through Pregnancy (zliving.com)
5. Monitoring A Pregnancy At Home With Your Smartphone - (engineersforum.com.ng)
6. https://www.academia.edu/49011968/Review_on_Mobile_Computing_and_its_Implications_in_Healthcare_and_Businesses