

A Conceptual Application of Big Data Analytics and IoT in Neonatal for Increasing Life Expectancy with Premature Babies

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Abstract- Technology is proven to be best when it's applied to save lives and when we use the best of technologies to save just born babies it's the ultimate fulfilment of it. According to the WHO, an estimated 15 million babies are born too early every year and approximately 1 million children die each year due to complications of preterm birth. Many survivors face a lifetime of disability, including learning disabilities and visual and hearing problems. One of the reasons for this plight is delay in identification of pathologies and untimely treatment. In Neonatal Intense Care Unit, the babies' health condition readings are recorded on paper periodically. And what's not of paper is not known to anyone risking the child's life. Just then come into sight a new hope- "Big data". Big data is a well-known technology that basically analyses enormous amount of data to figure out patters and trends. Big data has already made an impact in countless domains like manufacturing, media and entertainment, government and more. So, application of Big Data can be a breakthrough in the fight against premature death. Big Data basically helps us to find out if there are trends in premature infant's vital signs that could be an accurate predictor of infection. In this paper we are propose a framework that uses big data and IoT to monitor the baby's health.

Keywords- Neonatal, IoT, Big Data, Premature, Disability

I. INTRODUCTION

Giving birth to a baby is undoubtedly the most awaited and blessed moment for every woman. It takes an approximate of 40 weeks for a baby to shape itself. For several reasons at times babies come out of the mother's womb before they complete 37 weeks compared to a normal count of 40-42 weeks. These babies are termed as Preterm or Premature babies. Premature babies are of major concern as an estimated 15 million babies are born too early every year and approximately 1 million children die each year due to complications of preterm birth. . In India alone, 23% (>3.5millions) of preterm births are annually reported [1]. When we question ourselves for the reason behind such horrifying statistical report, we can deduce that the babies are extremely vulnerable to infections and damage to their brain, lungs or eyes. Preterm birth

complications account for 0.748 million deaths per year in India which is 26% of the world's neonatal deaths [2]. Aren't these statistics a little too scary? Another saddening fact is that preterm birth survivors are prone to lifetime disability like learning, visual or hearing impairments. Apart from this, lack of timely medication, care and identification of pathologies are major reasons for this high rate of preterm babies' death. Presently in Neonatal Intense Care Units we can find humans(nurse/doctors) taking a manual record of the baby's vital body parts functioning at regular intervals. Basically, NICU employs several medical devices to monitor & maintain the physiological parameters of the newborn such as; ventilator, incubator, ECG monitor, blood pressure monitor, pulse oximeter, transcutaneous oxygen/carbon dioxide monitor etc. along with the infusion pump to deliver drugs and fluids. These devices produce humongous amount of data each second and store the information maximum for 72 h[3]. The nurse or people employed to care of the babies record just the initial, final and a few more reading and based on these readings they generate report and provide medication. This is increasing the chances of not identifying infections at an early state. The key to tactfully handle this situation is to understand, analyse, interpret and implement the finds from the data that is recorded. Managing such huge amount of data efficiently is not an easy task for humans. This is where the BIG DATA and IoT come into the picture.

II. OBJECTIVES

To realise the need and advantage of using Big Data in Neonatal to increase the life expectancy rate of preterm babies.
To apply the concepts of Big Data for generating more accurate report.
To apply the concept of IoT to enhance the working of the proposed model.

III. PROBLEM STATEMENT

To create a prototype to save the lives of preterm babies by applying IoT concepts to collect biological data of the babies and use Big Data analytics to analyze and figure out and complications that would risk the baby's life.

IV. PROPOSED SYSTEM

Hardware Components:

Sensors: The baby's body functioning like the heart beat rate, pulse rate, urine levels, temperature and many more are measured using various sensors.

GMS: GMS is used to send a recorded message and a call to the hospital in-charge when in emergency.

Wearables: The various sensors are placed in a simple wearable form of device to make it easy for the baby to handle.

Shimmer Sensor: Shimmer sensor is the major component which is nothing but a platform where all the sensors can be placed in a single platform. Its nothing but an integrated platform on which we can place any sensors based on our choice. This is an efficient way to use sensors as it removes space constraint and makes it compact.

a. Shimmer Connect- is the microprocessor that is responsible of managing and handling all the data collected by the sensors. It is solely responsible for controlling and managing the device.

Wi-Fi: Via wi-fi we connect to cloud to store the data.

A. SOFTWARE COMPONENTS

R: We use R language to program all the algorithms and logics for analysis.

OpenIoT: We use this open source cloud in our methodology.

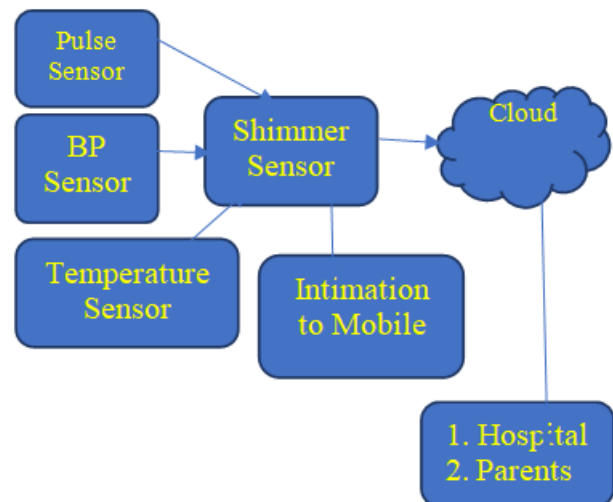
B. TECHNOLOGIES USED

IoT

Big Data Analytics

V. METHODOLOGY

In this proposed methodology, the minute the baby is admitted into the NICU, the baby is worn a wearable device that has myriad number of sensors to sense the functioning of the baby like Pulse rate sensor, BP sensor, temperature sensor and more. This data collected by the sensors is then stored in the cloud to facilitate accessibility. Also, when the microcontroller finds a deviation of the body values from the threshold values, it sends an intimation in the form of a call or message via GSM to the nurse or hospital authorities. While this is being done on one hand, the data uploaded to cloud, is analyzed using different algorithms and Big Data tools coded in R language to generate reports and find if there are any patters that might lead to an infection for the baby by considering all the data values procured from the differentsensors. Also, with the help if machine learning, it can even suggest the required medication, feeding intake and other parameter values that must be maintained for the baby's betterment of health. These reports are then sent to the hospital in-charge authorities for the implementation of the needful measures and to the baby's parents to monitor.



a. lock Diagram of the system

A. Advantages:

More efficient and accurate data can be collected.
 Early identification of infections
 Data can be accessed from anywhere and anytime
 Accurate and in-depth reports can be generated
 Human errors can be avoided.

VI. CONCLUSION

The future of healthcare is changing dramatically with medical technological advances starting to accelerate. As the future of healthcare is mainly dependent on saving one's life through various technologies, application of Big Data and IoT promises for a better future. Also, as already stated, application of technology to save a little one's life is the ultimate fulfilment of technology.

VII. FUTURE DIRECTION

When the proposed methodology can be used to suffice the current scenario, adding an element of AI can enhance the chances of saving the babies. In the current system, the sensors send an intimation to the nurse and parents to pass on the information that something isn't right with the baby. Sometimes it might just so happen that there might be delay in before they arrive. To avoid this such situations and not to risk the baby's life, we can send an intimation to an AI Robot that will poses the capabilities to perform basic first aid activities during emergency.

VIII. REFERENCES

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