



Neonatal Critical Care Emergency Response System

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Abstract: India ranks 52 in the global index interms of infant mortality rate as per the records of CIA World Factbook. Globally there are various causes such as Neonatal encephalopathy which usually results due to birth trauma or lack of oxygen to the baby during the birth, Infections, Complications of preterm birth, Lower respiratory infections and Diarrheal diseases which contributes majorly in Infant Mortality Worldwide. (Lozano et al., 2012). Giving attention at a proper timeline may minimize the loss of infant life. In order to address this issue a Critical Care Emergency Response System(CCERS) is introduced. The system uses a combination of PIR (Pyroelectric ("Passive") InfraRed) sensor in association with Artificial Neural Network (ANN). The proposed model can trigger and initiate a response system through which notifications by different means are initiated to draw the attention of crital care respondants through Global System for Mobile Communications(GSM) and by traditional alarm means.

Keywords : CCERS, PIR, neonatal, infant mortality, ANN

I. Introduction

As indicated by the current reports, IMR of India has declined by three focuses (8% decline), The outcomes imply that the key approach of the Ministry has begun yielding profits and the endeavors of concentrating on low performing States is paying off. Among the EAG States and Assam, all States with the exception of Uttarakhand have announced decrease in IMR in contrast with 2015. The decrease is accounted for as 4 focuses in Bihar, 3 focuses in Assam, Madhya Pradesh, Uttar Pradesh and Jharkhand and two focuses decrease in Chhattisgarh, Odisha and Rajasthan. Thus tending to death rate is extremely basic. There is as yet far to go to meet the 2019 focus of IMRs 28 for every 1000 live births. The statistics released by the Indian government in 2016 suggests 40 every 1000 live births. Currently the insights remains as The infant mortality rate stands at a total of 40.5 deaths/1,000 live births out of which male infant recorded as 39.2 deaths/1,000 live births, whereas the female infant stands at 41.8 deaths/1,000 live births as per the records of CIA world factbook. The certainties turning out are a touch of worry as far as death rate. Sigma and beta absolute convergence measures used to decide the idea of progress in the level of local imbalance in IMR demonstrate positive outcomes in accomplishing regional convergence. This affirms the administration arrangement and projects to control and lessen IMR have been effective. IMR is every now and again addressed as a measure of wellbeing status as newborn child mortality ends up being the principle focal point of wellbeing strategy; be that as it may, the whole populations wellbeing conceivably will be overlooked in accomplishing the policy targets (Jain & Jain, 2017).

II. Neonatal Period

The initial month of the life cycle is basically referred to as the neonatal period which has the highest possibility of risk factor on day basis when compared to any other period during the childhood. The risk of mortality recorded to be enormously high during the neonatal period when compared to the post neonatal (Sankar et al., 2016). In terms of an Indian perspective, India is responsible for one-fifth of global live births and more than a quarter of neonatal deaths. In the year 2013 India recorded highest deaths of neonates when compared to any other in the world. Over 6.3 million children less than five years of age died across the world. A statistics says that about 44% neonates died due to infectious causes and other preterm birth complications (Liu et al., 2015). Other than these some of the common neonatal mortality factors listed are rural-urban, poor-rich differences, Environment conditions, Maternal factors, Utilization of health services etc.

III. Pyroelectric ("Passive") InfraRed sensor (PIR)

PIR sensors enable you to detect movement, quite often used to identify whether a movement is recorded in the range of the sensor. They are smaller in size, cheap, utilizes very little power, don't wear out easily. Hence they

are ordinarily found in apparatuses and devices utilized as a part of homes or organizations. They are regularly alluded to as PIR, "Passive Infrared", "Pyroelectric", or "IR movement" sensors. PIRs are built with pyroelectric sensor, which can recognize levels of infrared radiation. They are capable of performing the task of motion detection under a controlled level of radiation. The sensors mechanism is functionally split into two sections, the first half portion of it will be adjudging the motion change exhibited if any incurred and the second one will be determining the sensitivity range. The two functions sum up with each other to resolve the objective. In the event that one half observes pretty much IR radiation than the other, the yield will swing high or low. The Sensitivity of the sensor extends up to 20 feet (6 meters) 110 degrees x 70 degrees location range. It can barely operate in a range of 3.3V - 5V input voltage.

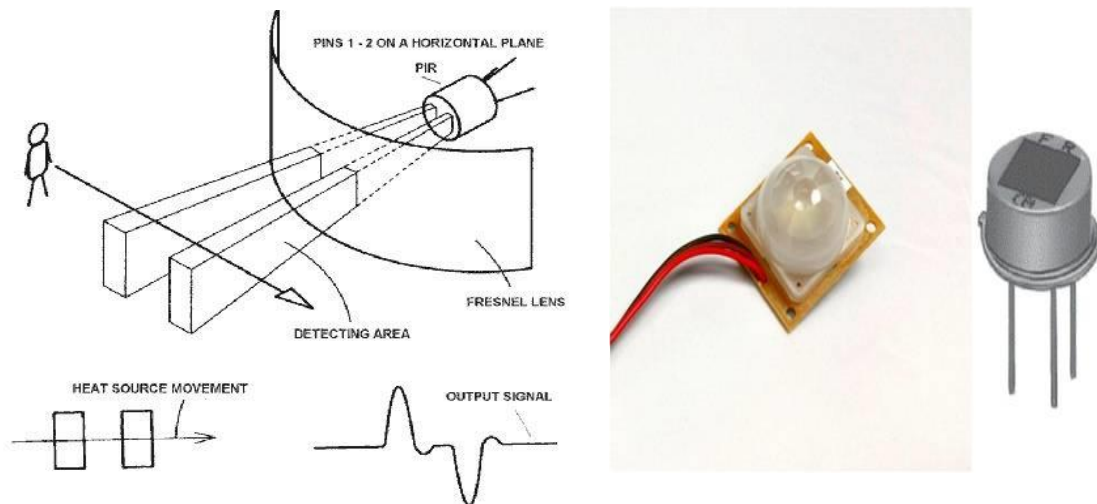


Figure 1. A Typical PIR setup with PIR

IV. Critical Care Emergency Response System (CCERS) Model.

Using imaging sensor, PIR sensor in combination with a well organized Artificial Neural Networks using predictive modeling and other combinative methods is the main idea behind the development of CCERS model.

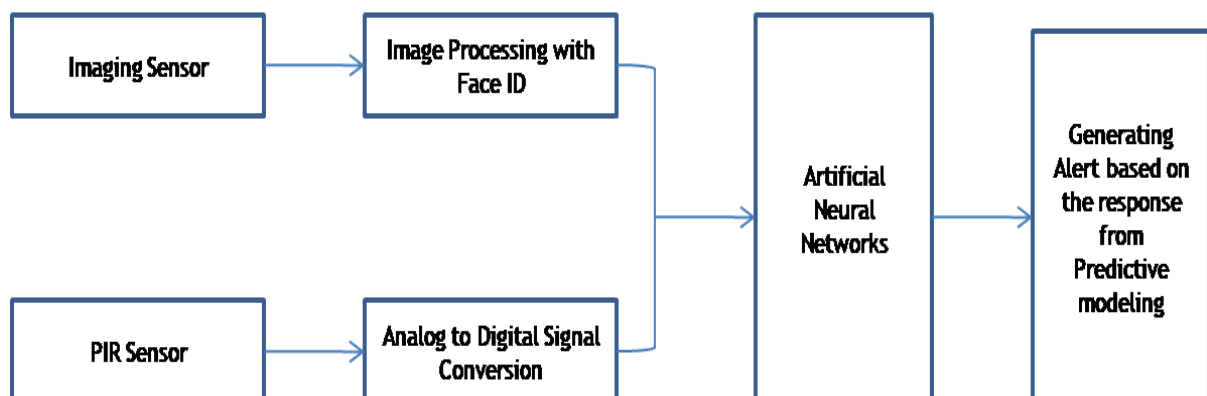


Figure 2. CCERS Working Model

V. Methodology

The model proposed will be helpful in identifying and responding to the emergency scenarios with the help and application of Artificial Intelligence. The idea behind this proposal is to use generate an Alarm system which don't generate noise and don not create any interference with any existing medical setup which may be harmful for the children in Critical Care Units (CCU's). The idea is to use a series of wirelessly transmission of High and Low frequencies and Low frequency signal generators and transmitters which will get the input from from PIR

sensors. The imaging sensor will acquire the image from the neonates location and will tag an identity number with the facial structure and generate an object ID after being processed. This process will also enable the system to track and monitor the neonates. The extended utilization of Internet of Things (IoT) will be aiding this cause (Prasad & Siddique, 2017). In the mean while PIR sensor will detect the motion and the motion detected in the form of analog signals are converted into digital signals before sent into the ANN chamber for performing predictive modeling. The resultant modeling output will trigger alarm by means of GSM calling to the duty doctors in case of any exingency, raising audible and acceptable decibel sounds in the perimeter in a controlled manner with help of an ANN server.

VI. Conclusion

The proposal moots wireless media as a bridge through piezoelectric oscillators, Electronic, and Mechanical sensors, Artificial Neural Network enabled Computer Server etc. So many innovative models in combination with ANN are being proposed even for classification of animals (Prasad, 2017). By keeping that in mind an attempt is made to develop a system to respond to the neonatal death in India. The technology is given a complete shape as a Critical Care Emergency Response System with the help of Artificial Neural Networks [ANN]. Using the ANN we can redefine the limitation of automated initiatives. The complete model will be lying over the platform of ICT and will be game changer in CCU's where there is a severe demand of such systems to save lives. This is currently proposed in conceptual mode with a model projection and estimation. This model once developed can be implemented across all neo natal critical care centers without any geographic limitation.

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