CMR ENGINEERING COLLEGE

Department Of Electronics And Communication Engineering

A Major Project on

Portable Baby Incubator Using Raspberry pi

Under The Guidance Of

Dr. SUMAN MISHRA,

Head Of Department,

ECE,

CMREC.

Submitted by: BATCH A5

218R1A0417 GADIREDDY MANOGNA

218R1A0418 GAJULA SAI KUMAR

218R1A0419 GAJVALLI SAI NIKIL

218R1A0420 GARINE VARSHA SRI

CONTENTS

AIM

The aim of this project is to build a portable battery based baby incubator. This emphasizes a more proactive approach in ensuring baby safety in rural areas by acknowledging the need for adaptive solutions that consider the unique challenges of these communities.

MOTIVATION

- Many rural communities lack equipment, a portable incubator can provide a stable and monitored environment for sick newborns during transport to a hospital, which will significantly improve chances of survival.
- In rural areas power outages are especially more which can disrupt medical equipment, where as battery powered incubators can provide uninterrupted care.
- Incase of natural disasters portable incubators can be deployed quickly to provide vital care in emergency situations for newborns.

ABSTRACT

- We are designing an IOT (Internet of Things) device i.e a portable baby incubator powered by battery and essentially required in rural areas.
- Equipped with various features to support environmental engineering with various sensors and actuators which function to optimize the temperature and humidity.
- The incubator will create a stable environment with constant temperature, humidity, and oxygen levels essential for newborn survival.
- The system hardware design consists of sensors, actuators, ESP32, ESP32-Cam, LCD and raspberry pi based Microcontroller Unit.

INTRODUCTION

What is an INCUBATOR?

A device that offers a safe space for infants to live and grow as their organs develop. It is also known as neonatal incubator.

What is an PORTABLE INCUBATOR?

A device which is temperature-controlled, lightweight and continuous monitoring system for premature or low-birth-weight infants.

EXISTING METHOD

- Traditional incubators are bulky and require constant access to a power source, hindering use in remote areas during transport or emergencies.
- Includes small portholes for caregivers to interact with the infant while minimizing exposure to outside air and contamination.
- Typically non-portable, designed for use in hospital NICUs, making it unsuitable for transport.
- Caretakers manually monitor the baby’ s vital signs, as the incubator itself had no built-in monitoring systems.

DRAWBACKS OF EXISTING SYSTEM

- **High Cost:** Modern baby incubators can be expensive, making them less accessible in low-resource settings.
- **Limited Mobility:** They are often bulky and stationary, making transportation within hospitals difficult.
- **Risk of Infection:** Despite being sterile, frequent handling through ports can introduce infection risks.
- **Dependency on External Power:** Most incubators rely on continuous power, and disruptions can endanger the baby.

PROPOSED METHOD

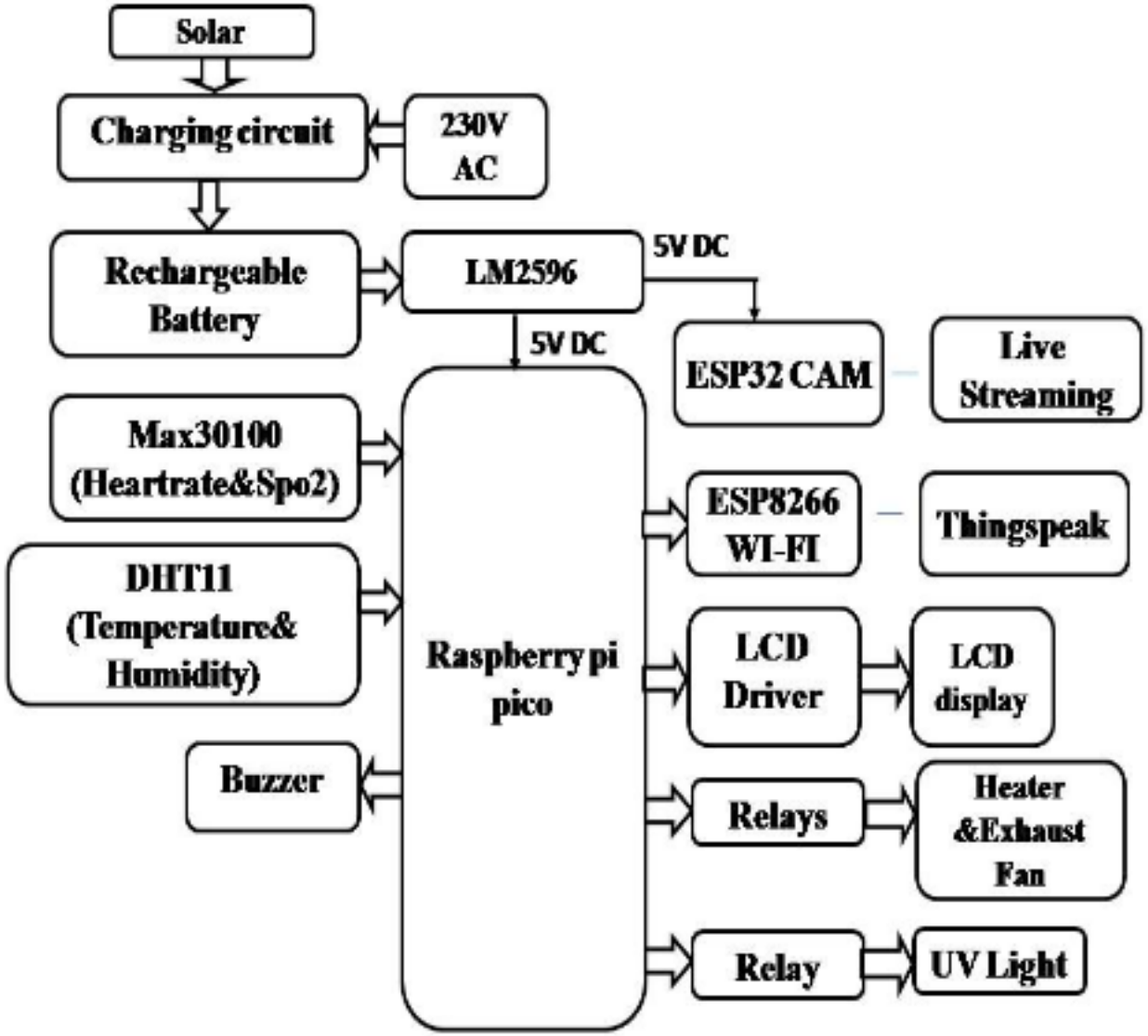
- Incorporated safety feature, such as alarm alerts for critical baby conditions when vital signs fluctuate significantly.

- UV lights and humidifiers maintain humidity levels and treat infections like jaundice.

- Heating and cooling elements are controlled by a Raspberry Pi,to maintain the incubator’ s temperature when it drops below a threshold.

- A camera provides continuous baby monitoring, with live feed transmitted via ESP-32.

BLOCK DIAGRAM



WORKING OF THE PROJECT

- Incorporated safety feature, such as alarm for critical conditions of the baby ,when there is a huge fluctuation in vital signs.
- When there is a huge fluctuation in humidity to maintain this levels in incubator we are using UV lights to cure infections like jaundice.
- When there is a huge change in temperature the raspberry pi uses heating and cooling elements to maintain the incubator’ s temperature.
- For continuous monitoring of baby, a camera is included and live footage of the baby and vital parameters are transmitted through esp-32.

ADVANTAGES AND APPLICATIONS

ADVANTAGES:

- Portable incubators allow for easy transportation of newborns, especially in emergency or rural settings.
- They are often more affordable than traditional, stationary incubators, making them accessible in low-resource areas.
- these portable incubators use less power and can run on batteries, ensuring continued operation during power outages or while on the move.

APPLICATIONS:

- **Emergency Transport:** Used during the transfer of premature or ill newborns between hospitals or from remote areas to specialized care centers.
- **Home Care:** Allows for the safe transition of stable but vulnerable infants from the hospital to home, with continued temperature and environment control.

FUTURE SCOPE

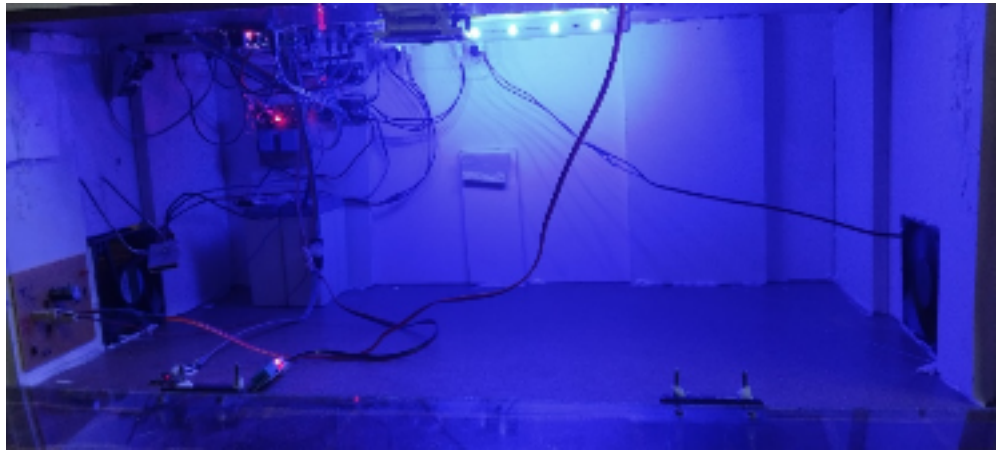
- **Infection Prevention Filters :**
  HEPA Filters: Removes airborne contaminants and bacteria.
  UV-C Sanitization: Reducing the risk of infection.

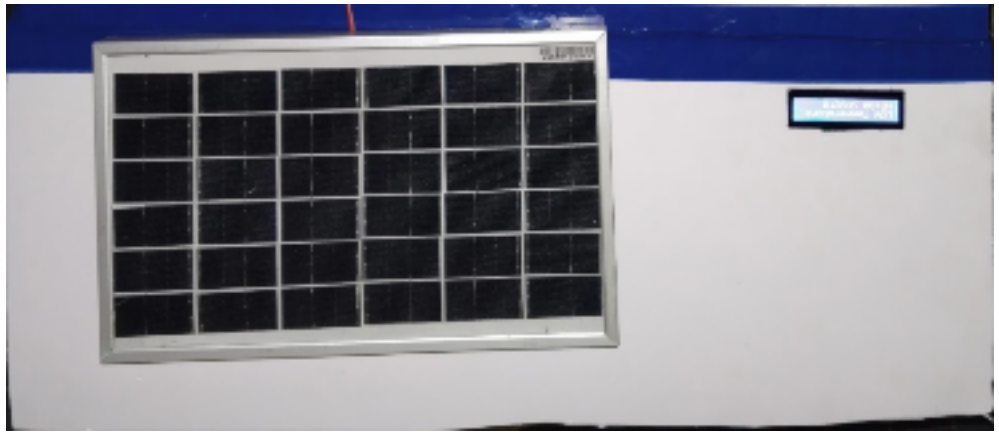
- **Feeding Tube Integration:** The feeding tube used to deliver nutrients and milk to the infants, which is controlled by raspberry pi.

- **Comfort Pillow:** The pillow is embedded with vibrating motors which gives massaging effect to baby and increases blood flow ultimately promotes to sleep without aid of caretakers.

RESULT

- Smart & Automated Neonatal Care – The Raspberry Pi-based system automatically controls temperature, humidity, and vital signs, ensuring a stable environment for newborns.
- IoT & Remote Monitoring – Live data streaming (ESP32) and cloud-based monitoring (ESP8266 & ThingSpeak) allow doctors to track an infant’ s condition remotely in real time.
- Sustainable & Cost-Effective – Operates on solar power, making it ideal for off-grid locations, and provides a low-cost alternative to traditional incubators, improving neonatal care accessibility.





REFERENCES

1. Rahma, S.A. and Mukhaiyar, R," Pengujian Esp32-Cam Berbasis Mikrokontroler ESP32" , Jtein, 4(1), pp. 60– 66,2023
2. Bernie E Medise, " Growth and Development in Preterm Infants: What is The Long-Term Risk?" , Medise. Amerta Nutr . supl.27-33.DOI: 10.20473/amnt.V5i1SP.2021.27-33. 2021.
3. A. Kiki, H. Faisal and H. Junas, " Development of a Real Time Premature Baby Incubator Monitoring System Using Android" , Jurnal Amplifier Vol 10 No 2 P-ISSN 2089-2020 dan E-ISSN 2622-2000, November 2020.

THANK YOU !