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Innovative IOT Covid-19 Monitoring System to Ameliorate Medical Professionals

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Abstract— Special quarantine centers setup to handle COVID-19 patients have experienced an overflow of patients as cases of the infectious disease keep on rising. Doctors assigned to these quarantine centers have had a difficult time keeping track of the health conditions of the patients in quarantine. The doctors assigned to such setups have an increased risk of infection due to their interactions with the patients. In order to enable the health workers to efficiently monitor the quarantined patients and reduction of in-service infections, this study proposes to design an innovative IOT based using IOT Gecko platform health monitoring system able to remotely monitor the health of the patients and send automated reports to doctors' over a set internet connection. The proposed system will be equipped with heartbeat sensor, temperature sensor and BP Sensor to keep track of respective health conditions of the patients. If successfully designed and implemented, the systems will be enable doctors to remotely monitor patient's heartbeat, temperature and blood pressure reducing the risks of infection and increasing the number of patients a single doctor can monitor at a time.

Keywords— IOT device, remote monitoring, IOT Gecko, doctor safety

I. INTRODUCTION

In 2019, the world first heard of the emergency of a novel coronavirus. Initial reports of infection were made in city in China in the December of 2019 [1], with the WHO declaring it a global pandemic in March 2020 [2]. The disease is caused by the highly contagious coronavirus 2019 (COVID-19) [2]. Since then, the world is still dealing with the a pandemic which has negative impacted on the global economies including those of the most developed countries. Digital health technologies have shown to have a high potential in fighting pandemics such as the Covid-19 [3], [4]. Advances in science and technology especially those aimed at the health sector have played a significant role in helping people fight infections, the spread and impact of the

Covid-19 across the globe [5]. However, the existing information technology solutions have faced a lot of growing challenges in fighting the pandemic requiring the development of new technological systems to help tackle the pandemic [6]. IOT technologies have evolved in medical equipment and are helping in the handling of the pandemic [7].

II. PROBLEM STATEMENT

The pandemic has become major threat to health systems with some almost getting over due to high number of cases needing medical assistance and specialized care [8]. Doctors as frontline workers fighting against Covid-19 have been required to regularly monitor patient health however, the first rising number of cases have increased the number of patients a single doctor is tasked with monitoring creating an artificial shortage of doctors. Furthermore, the frontline doctors have been noted to have an increased risk of infection with some of the infected doctors succumbing to the disease [9], further creating a wider gap between the available healthcare manpower and the needed manpower to sufficiently monitor and maintain the health systems running [10].

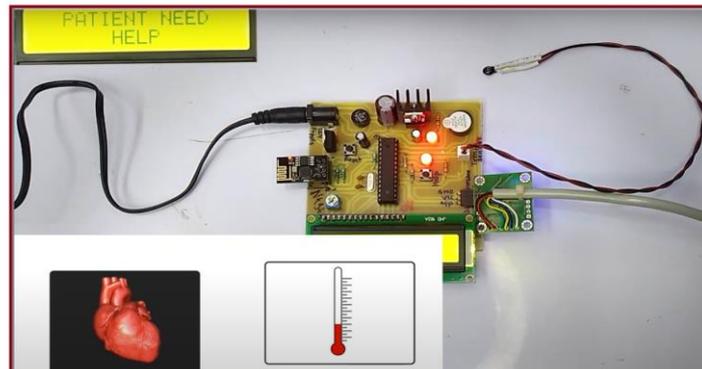
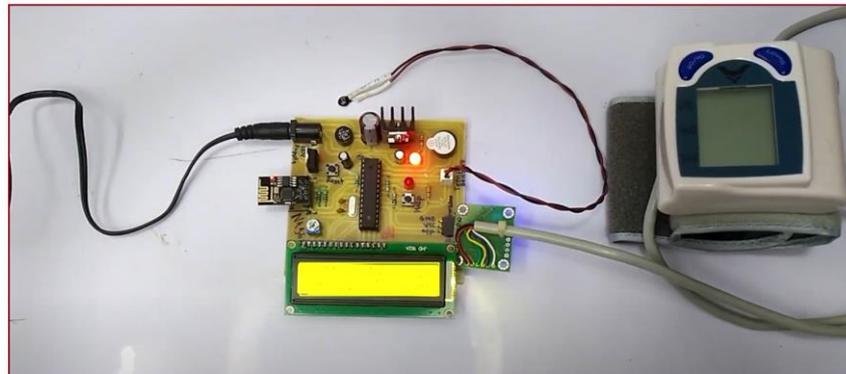
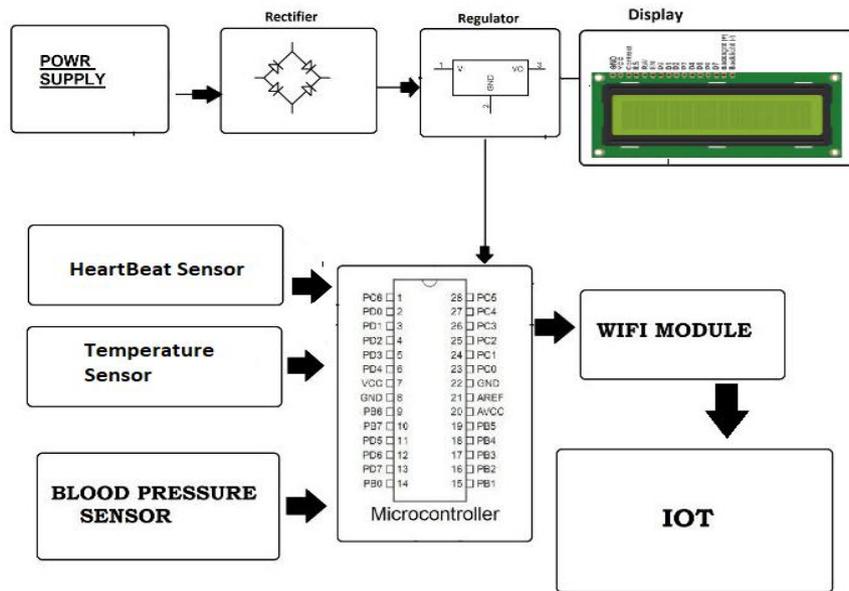
III. PROPOSED METHODOLOGY

Statistical data focused on the daily number of patients in select quarantine centers will be collected and added to the existing number of active patients within the quarantine centers. The monitoring processes will also be observed from which data on the current patient to doctor ratios will be calculated. The number of health workers infected during the delivery of care service will also be collected. Data collection and observation will be carried within a period of 2 months analyzed to establish the need for the proposed solution.

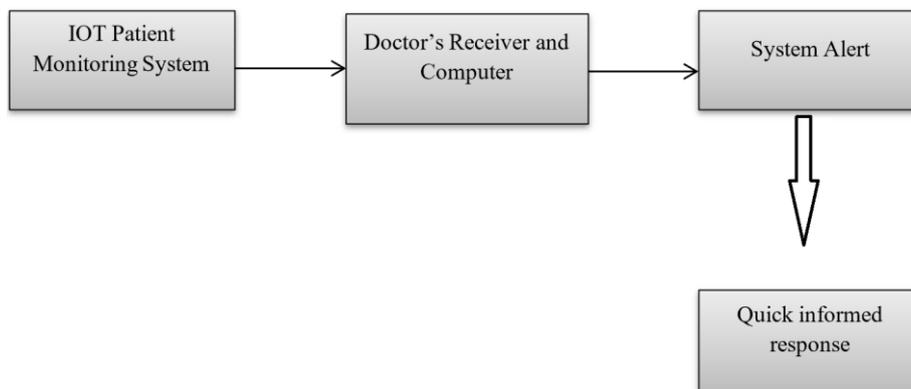
IV. PROPOSED SOLUTION

Based on data collected and the problem statement developed, it was established that a technological solution was needed to help assist the doctors in quarantine centers handle the high number of patients and reduce their risk of exposure and infection. Modern technologies have proved to assist in tackling the Covid-19 pandemic with great success [5]. This proposal aims at designing and developing an IOT based health monitoring system that enables doctors to remotely monitor multiple Covid-19 patients over the internet. The system's hardware and software specifications will include an Atmega Microcontroller, a temperature Sensor, a heartbeat Sensor, a blood Pressure Sensor, a LCD display, an Arduino compiler, a WiFi Module based on the IOT Gecko platform; an open source IOT platform [11]. With these hardware and software specifications, will be designed to be mounted to the bedside of the patient and constantly monitor the critical health conditions of the patient. The system will then transmit these sets of data over a WiFi enabled internet connection to the doctors' receiver and computer. The LCD display mounted on the system will also display patient information without the doctors having to get in contact with the patient to collect tests such as vital conditions. Changes observed in the patient health will be transmitted to the monitoring doctor and an emergency alert and response initiated automatically.

V. BLOCK DIAGRAM



VI.FLOW CHART



VII. EXPECTED OUTCOME

EXPECTED OUTCOMES POST IMPLEMENTATION OF THE PROPOSED REMOTE IOT COVID-19 PATIENT HEALTH MONITORING SYSTEM

The proposed remote patient health monitoring systems is expected to harness the power of IOT and internet technologies to increase the doctor’s capacities to monitor and handle multiple Covid-patients expected to be 500 patients per doctor. This will not only help meet the current health systems’ demand for health professionals during the pandemic, it will also help reduce doctor-patient conduct eliminating the increased risk of doctor infections. The system will also help reducing the Coivd-19 monitoring expenses as less manpower is required to carry out monitoring and the proposed piece of technology is affordable.

The proposed Remote IOT Covid-19 Patient Health Monitoring System is also expected to support and strengthen the health systems as it enable other doctors to handle other diseases and health demands rather than have a majority of the doctors focused on Covid-19 alone. The automated emergency alert based on anomalies observed in the patient’s health will help safe lives and reduce the death rate associated with the disease.

VIII. CONCLUSIONS

The advances in technology and information systems have found applications in the health sectors with various aspects of IT contributing to the changing landscape of health service delivery. The Covid-19 pandemic has created great opportunities to develop new health technologies to support the fight against the viral pandemic. The Remote IOT Covid-19 Patient Health Monitoring System is a IOT based system that is expected to increase efficiency in health monitoring of Covid-19 patients under quarantine or treatment by increased the capacity of doctors and reducing their exposure rates to the disease. Therefore, this remote monitoring system will significant be an advantage to the health system in fighting against the pandemic and reducing in-service doctor infections.

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