IoT-based Wireless Sensor Network for Patient Care

TEAM #68

Team Members: David Dominguez, Oluwapelumi Omosanya, Anthony Yemi-Akiniyi

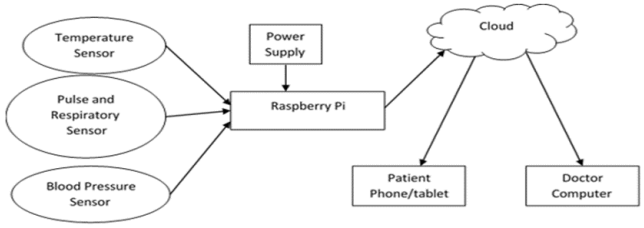
Project for: Northern Illinois University

Client Contact: Dr. Ji-Chul Ryu (jryu@niu.edu), Dr. Pradip Majumdar (pmajumdar1@niu.edu

**Abstract: — IoT and cloud computing are the prime objective of the current design project and development in the field of healthcare. In this project, an attempt is made to enhance the integration of wireless sensor network in IoT environment with cloud computing for health care system. IoT is a dynamic network infrastructure, that interconnects different sensor networks through Internet, acquire sensor data/information, transmit and receives data/information for further processing. The related sensed data/information will be sent for the necessary information exchange together with the design and optimized parameters. Work will involve fabricating a prototype design using an affordable microcontroller system along with appropriate sensors.**

## 1. Introduction

**The number of patients that require medical assistance is increasing each day while staff-patient ratio is unbalanced causing issues such as treatment delay that often leads to patient dissatisfaction. Healthcare devices are also complex and challenging to be handled and not readily available in certain parts of the world. Lack of staff and challenges in operating the medical devices not only affect patients in hospital but also cause problems to home care patients that require full attention and constant monitoring. This urges for a development of a new method or technology. IoT devices in health care has been the leading solution to help combat this issue however majority of the IoT devices developed today are very expensive and are only capable of performing one task so a more cost effective and versatile solution is necessary. The design of IoTSNPC (Device 68) aims to improve the quality of lives of people without the hardships of constants visits to the hospitals and high costs of simple medical checkups and expensive inhouse health care devices. The configuration of this device creates a balance between weight, cost, and functionality while incorporating safety features with dynamic feedback control.**




## 2. Design Features/Methods

**An attempt is made to enhance the integration of wireless sensor network in IoT environment with cloud computing for health care system. This design is going to consist of dynamic network infrastructure, that interconnects different sensor networks through Internet, acquire sensor data/information, transmit and receives information for further processing. The platform is built around a wearable sleeve that will include appropriate sensors connected to a microcontroller and a power source.**

### A) Microcontroller:

**The micro controller being used for this device is Raspberry Pi 4. It is the ultimate Raspberry Pi, it has up to 4GB RAM, a faster quad-core CPU, support for dual displays at up to 4K resolution, Gigabit Ethernet, USB3.0, wireless LAN, Bluetooth 5.0, and USB-C power.**

### B) Oxygen/Heart rate sensor:

**The oxygen/heart rate sensor for this device is a Wellue O2 Ring Oxygen tracker. This is a ring-shaped Bluetooth sensor that continuously trackers oxygen levels, heart rate and body movement. It has a built-in rechargeable battery that can last 12-14 hours, and it also has built in memory to store information.**

### C) Blood Pressure Sensor:

**The blood pressure sensor used in this device is a using UltraConnect's Wireless Wrist Blood Pressure Monitor. It is a small, lightweight blood pressure monitor that syncs quickly with the controller. The sensor transmits data via Bluetooth; however, it does not sense blood pressure continuously. The sensor can track both systolic blood pressure and diastolic blood pressure as well as heart rate. It is rechargeable and can last up to 100 uses before needing to be charged again.**

### D) Temperature Sensor:

**Smarttemp is an FDA Approved smart Bluetooth temperature sensor that allows patients to track their body temperature in real time through a computing device using safe low energy Bluetooth 4.0. SmartTemp is 100% waterproof with a sealed battery compartment with no charging or dangerous battery**

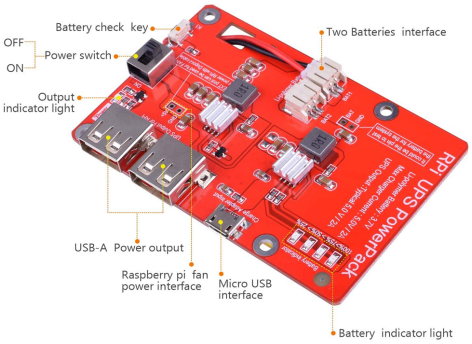
leakage. Smarttemp is placed under patient's arm using a soft adhesive patch that feels like tape. Painless removal.

**E) LCD Display/ User Interface:**

The LCD display used is the 4inch HDMI LCD (H) 480x800 hardware resolution display. It has a 4-inch Resistive Touch Screen Display IPS LCD with HDMI interface, perfect displaying from very wide viewing angle. It comes with 3.5mm audio jack, supports HDMI audio output. Backlight can be turned off to lower power consumption. The user interface used for this device is a simple GUI developed using python coding. It follows a very simple format of displaying the various data readings and displaying the continuous plots of the various reading.

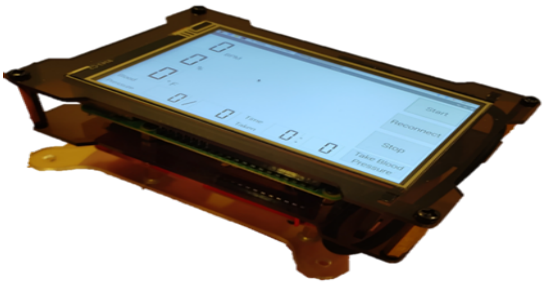
**F) Battery Pack:**

The Raspberry Pi and Display are powered by lithium polymer batteries by means of the Quimat battery expansion board. The power-on state can automatically detect the load and start the output function, and automatically turn off the output when there is no load. ·The size and mounting holes are exactly the same as the Raspberry Pi for easier installation and use. ·It's convenient to power on / off raspberry pi via battery switch; ·It can last about 9 hours if only pi 3. ·The Lithium battery expansion board can be also used on cellphone. ·Battery capacity: 3800mAh ·Maximum output current: 2A ·Output voltage: 5.1V ± 0.1V ·Standard charging current / voltage: 2A/5.0V Package included: 1 x Lithium Battery Expansion board (with lithium battery) 3 x heat sink 4 x Gasket 8 x Copper standoff 12 x Screw 12 x Nut 1 x Micro USB cable 1 x Acrylic Case




**3.Conclusion**

The main goal of this project is to show how important artificial intelligence is to human lives and how significantly improve our lives. The device makes use of multiple wearable sensors capable of reading important vital signs, such as blood pressure, heart rate, respiratory rate, and temperature that communicate information with small computer board, that can then send the information to the cloud wirelessly. IoTSNPC will allow users to have a greater knowledge of their heath and allow them to take necessary precautions to improve their health in the comfort of their homes.



**4.Acknoledgement**

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