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Comparative study of various boards used for health monitoring applications

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Abstract:

Over the last decade, healthcare monitoring systems have emerged as one of the most significant systems, becoming more technology oriented. Humans are dealing with an issue of untimely death owing to numerous ailments, which is caused by a lack of timely medical care for patients. The primary goal was to develop a dependable IoT-based patient monitoring system so that healthcare practitioners could better monitor their patients who were either hospitalized or at home using an IoT-based integrated healthcare system. To provide improved patient care, most corporate hospitals have invested in advanced technologies. We'll have a look at the various boards. The Arduino UNO, Launchpad MSP430, Node MCU, and Raspberry Pi 3B+ are all examples of microcontrollers.

Key words: Arduino, Board, Healthcare, Microcontroller.

1. Introduction: To create medical monitoring equipment. Various manufacturers use various microcontrollers, and the details of the board are covered in this section.

The modern goal of the healthcare sector, as stated in our paper, is to give better healthcare to patients anytime and everywhere in the world in a more cost-effective and patient-friendly manner. As a result, there is a need to develop patient monitoring equipment in order to increase patient care efficacy. When it comes to patient monitoring, the medical world now faces two primary problems: first, the necessity for healthcare providers to be present at the bedside of the patient, and second, the patient is confined to bed and hooked to huge machines. The above-mentioned issues must be addressed in order to provide improved patient care. The acquisition of physiological parameters such as heart rate, body temperature, and ECG, as well as their display via graphical user interfaces, are discussed in this work.

2. Module description:

Arduino UNO:

Arduino is an 8-bit microcontroller development board with a USB programming interface for connecting to a computer and additional connection sockets for connecting to external electronics such as sensors, motors, speakers, diodes, and so on [1]. It has both input and output pins, with the input pins being either digital (0 – 13) or analogue (A0 – A5), and the output pins being only digital (0 – 13) [2]. The Arduino board design is open source, as is the integrated development environment, which includes a cross-compiler, a debugger, and a serial monitor to control the inputs and outputs. Arduino can be powered by a computer's USB connection, a 9V battery, or a power supply [3].

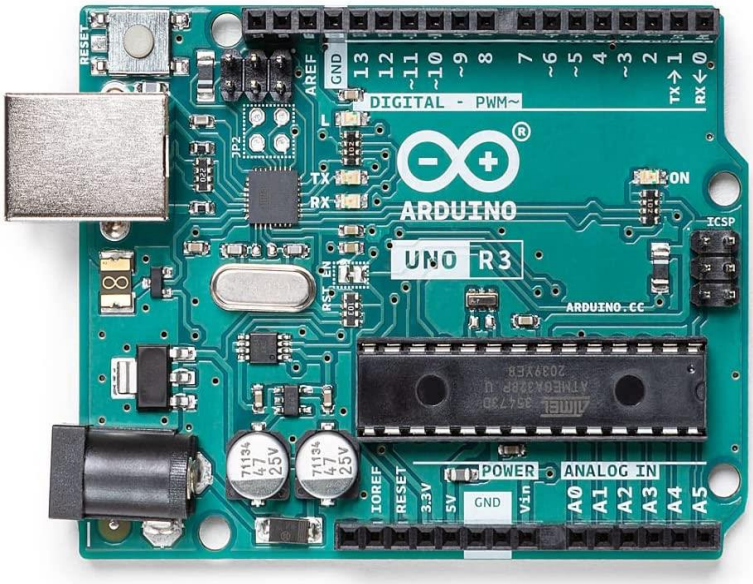

Fig: Arduino UNO

Launchpad MSP430:

The Texas Instruments MSP430 family of ultra-low-power microcontrollers consists of a number of devices with a variety of peripherals aimed at specific applications. The architecture, in conjunction with five low-power modes, is optimized for extended battery life in portable measurement applications. The device has a powerful 16-bit RISC CPU, 16-bit registers, and constant generators to help with code efficiency. The digitally controlled oscillator (DCO) enables wake-up from low-power to active mode in less than one second. The MSP430G2x13 and MSP430G2x53 series are ultra-low-power mixed-signal microcontrollers with built-in 16-bit timers, up to 24 I/O capacitive-touch enabled pins, a versatile analogue comparator, and built-in communication via the universal serial bus. The MSP430G2x53 family members also include a 10-bit analog-to-digital (A/D) converter.

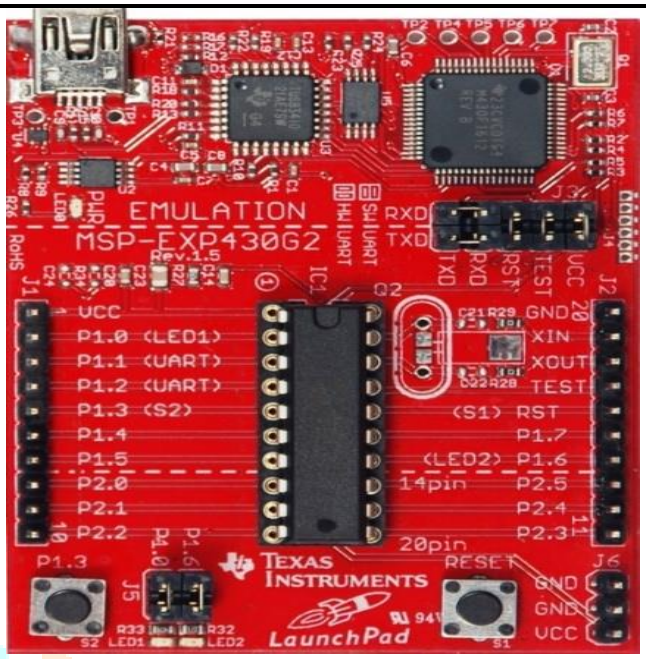

Fig: Launchpad MSP430

Node MCU ESP8266 & ESP32:

ESP8266:

This is an open-source development board with a firmware-running ESP8266 module. The ESP-8266 module is a microcontroller board that can be programmed wirelessly. The ESP8266 Wi-Fi board is a system-on-chip (SOC) with an integrated TCP/IP protocol stack that can connect any secondary microcontroller to a Wi-Fi network [5]. The ESP8266 board is capable of hosting an operation or discharging all Wi-Fi networking functions to another operation processor, making it more ideal for use as a seeing knot that can sniff data from numerous wirelessly linked IoT sensor bumps and send it to a central garçon like a computer [5].

Fig: Node MCU ESP8266

ESP32:

Fig: Node MCU ESP32

Raspberry pi:

Raspberry pi 3B+

Raspberry Pi is a computer-based development board that runs Raspbian Linux, a Linux distribution. It can function and be connected to a mouse, keyboard, and screen just like any other computer to perform computing functions. The Raspberry Pi B+ board includes a 32-bit processor, four USB ports, an HDMI port, an Ethernet port, an audio port, a CSI camera connector, and a micro-SD card slot [2]. It also has 40 general-purpose I/O ports. Model 2 lacks embedded Wi-Fi, but a Wi-Fi adapter can be used via the USB port to connect to the internet. New Raspberry Pi 3 models include an integrated Wi-Fi module on the board, making it easier to configure internet connectivity.

Fig: Raspberry pi 3B+

3.Results:

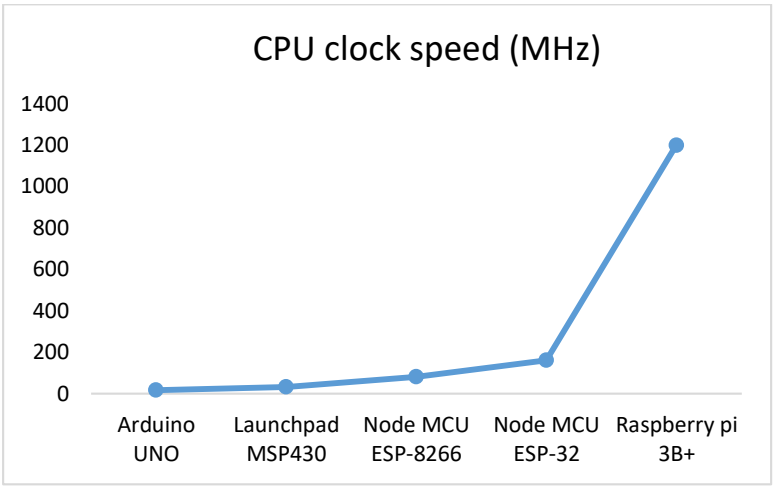

Figure 1:

The clock speeds of several MCUs are shown in Figure 1. Because the Raspberry Pi has the maximum clock speed of 1.GHz and the Arduino Uno has the lowest clock speed, the RaspberryPi is preferred for IoT applications.

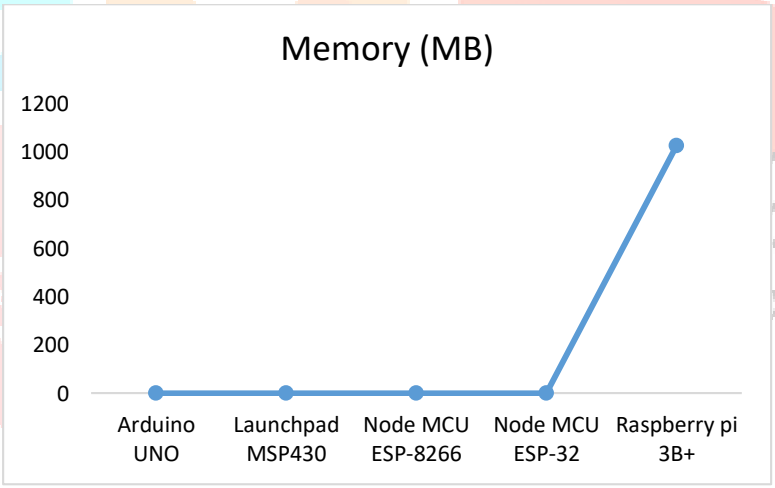

Figure 2:

The memory (RAM) of various MCUs is shown in Figure 2. The RAM capacity of the Raspberry Pi is the highest, while the RAM capacity of the Arduino Uno is the lowest. The more RAM you have, the more commands and data you can store. Raspberry Pi is the finest option for achieving speedy output.

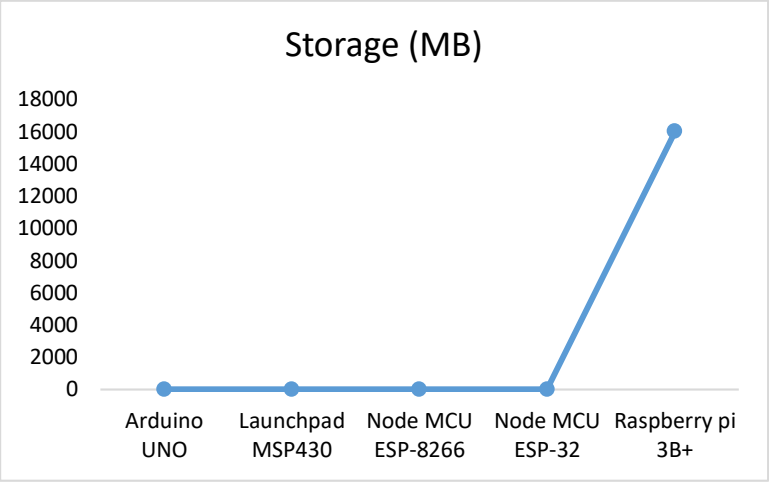

Figure 3:

The storage capacity of several MCUs is shown in Figure 3. The Raspberry Pi has storage capacities of 8GB and 16GB, and the Arduino Uno has a memory capacity of 0.032 MB. Less storage is preferable for simple applications. The higher the RAM, the better the performance, therefore the Raspberry Pi gives the best results.

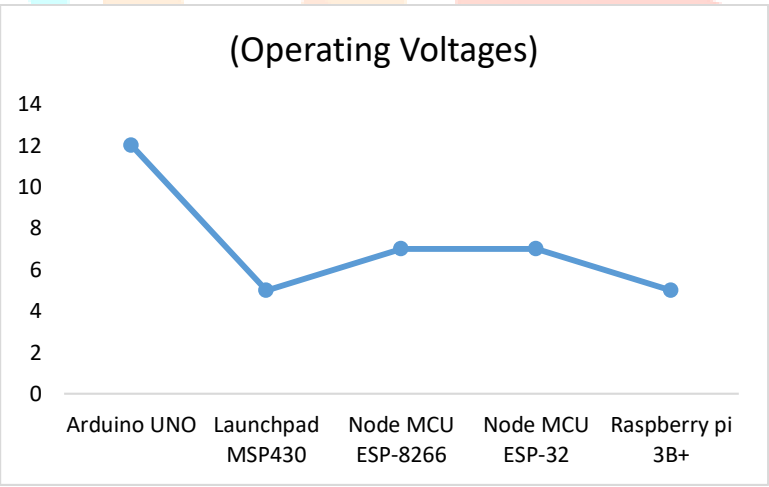

Figure 4:

Figure 4 depicts the voltage requirements for various MCUs. The Ardunio Uno requires greater voltage than other boards, making it unsuitable for long-term battery usage. MSP430 is ideal for wireless sensing applications since it can operate at three different voltage levels. In order to work, NodeMCU and Rasperrypi require a substantial amount of voltage.

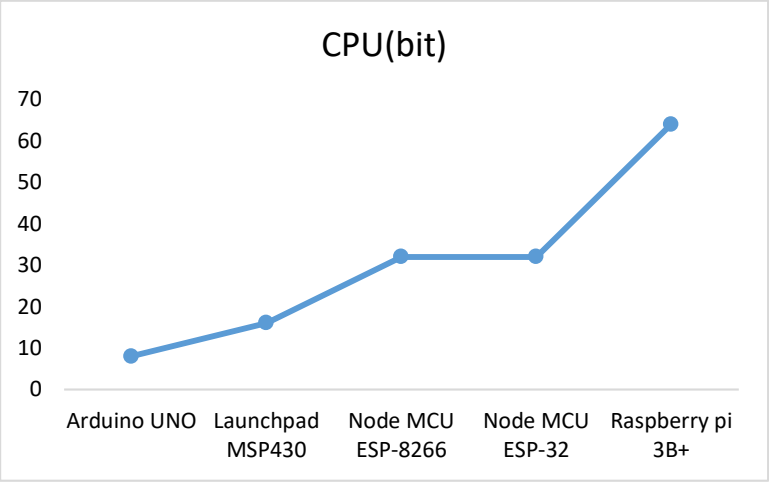

Figure 5:

Figure 5 depicts the CPUs of many MCUs. The Raspberry Pi is a 64-bit system on a chip, whereas the Arduino Uno is an 8-bit microcontroller. For small projects, the Arduino Uno is the best option. For real-time applications, the Raspberry Pi is the best option. It conducts fetch, decode, and execution relatively quickly when compared to other boards.

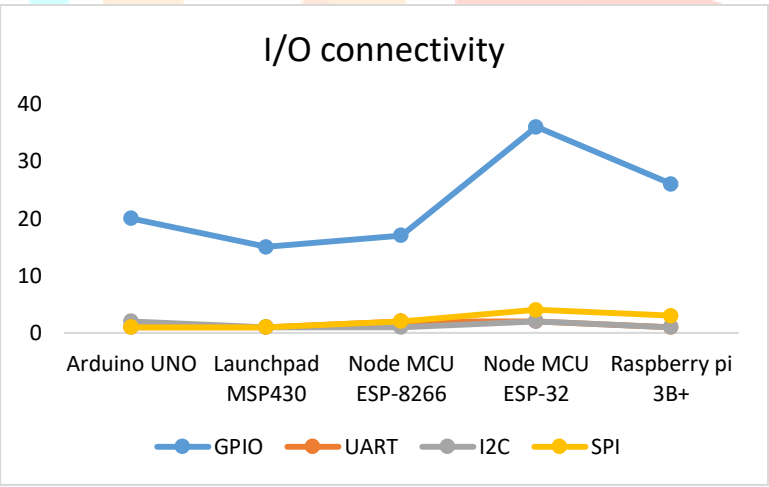

Figure 6:

The I/O connection of several MCUs is shown in Figure 6. The Raspberry Pi does not have any analogue I/O ports, so any analogue sensor we connect directly to the Raspberry Pi will require an ADC connection, and the ESP 8266 only has one analogue port, whereas the esp32, Arduino, and msp430 all have many analogue i/o ports, allowing analogue sensors to connect directly to those boards. I2C, SPI, and UART are all available on every board.

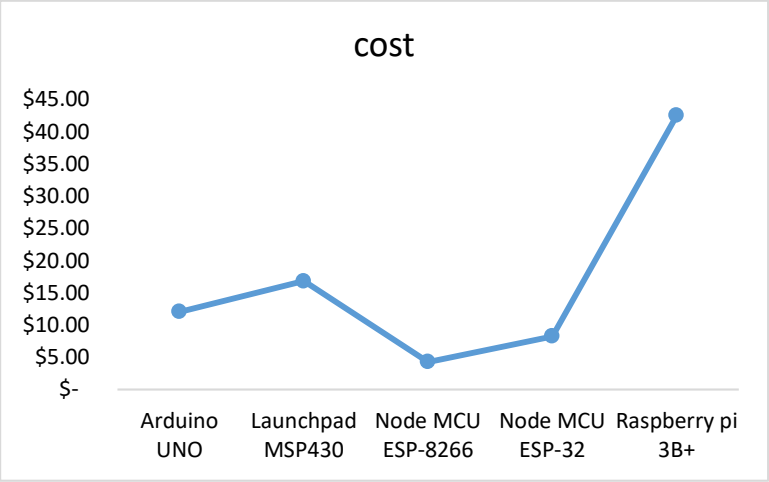

Figure 7

When comparing the above figure to all MCU, The Node MCU ESP32 is a low-cost device, while the Raspberry Pi is a high-cost device that provides IoT connectivity.

4. Conclusion:

From the explanation above, it is clear that the Raspberry Pi board has superior features in all categories, with the exception of pricing.

References:

1. A. Javed, "Arduino Basics: Building Arduino Projects for the Internet of Things," in Experiments with Real-World Applications, Apress, 2016, pp. 3-13.
2. S. M. Alzahrani, "Sensing for the Internet of Things and Its Applications," in 5th International Conference on Future Internet of Things and Cloud Workshops, 2017.
3. S. Monk, Programming Arduino, New York: McGraw-Hill, 2012.
4. M. Mirjana, "Raspberry Pi as Internet of things hardware: performances and constraints design," no. 3, 2014.
5. D. R. P. Patnaikuni, "A Comparative Study of Arduino, Raspberry Pi and ESP8266 as IoT Development Board," International Journal of Advanced Research in Computer Science, vol. 8, no. 5, pp. 2350-2352, 2017.
6. P Joshua Reginald , mv raju kisan seva – aadhaar linked smart farming application annab of romaiah society for cell biology 2021 5168-517
7. Mahaboob Ayesha , p Joshua Reginald a smart and efficient way for detecting and controlling the forest fire by using sparse topology and energy management protocol international journal of an Research education and societies methods (IJARESM) vol 10 issue 1 2022