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# Covid Medikt with Matlab Using Arduino

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**ABSTRACT:** Arduino UNO based project that is suppose to calculate SPO2, Heart rate and monitor ECG of a patient. It uses the MAX30100 pulse oximeter and AD8232 ECG sensor module. SPO2 and heart rate is displayed on the 0.91" inch OLED display. And the ECG readings are analyzed and posted on ThingSpeak website. This project requires knowledge of Arduino IDE and Matlab for better understanding. This is a good entry level project to work on if you wish to learn how to take data from an Arduino and then use Matlab for data analysis.

## I. INTRODUCTION

### 1.1 Research Background

This Heart Rate Monitor Kit With AD8232 ECG Sensor Module is used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram and output as an analog reading. ECGs can be extremely noisy, The Heart Rate Monitor Kit With AD8232 ECG Sensor Module acts as an op amp to help obtain a clear signal from the PR and QT Intervals easily. The AD8232 is an integrated signal conditioning block for ECG and other biopotential measurement applications. It is designed to extract, amplify, and filter small bio potential signals in the presence of noisy conditions, such as those created by motion or remote electrode placement.



AD8232 ECG Sensor Module

## II. SOFTWARE ASPECTS

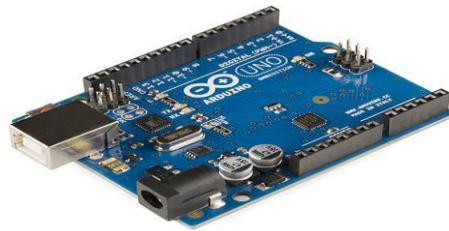
**MATLAB :-** it is a proprietary multi-paradigm programming language and numeric computing environment developed by MathWorks. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages.

**THING SPEAK API :-** it is an open-source software written in Ruby which allows users to communicate with internet enabled devices. It facilitates data access, retrieval and logging of data by providing an API to both the devices and social network websites. ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications.

**ARDUINO IDE :-** The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board.

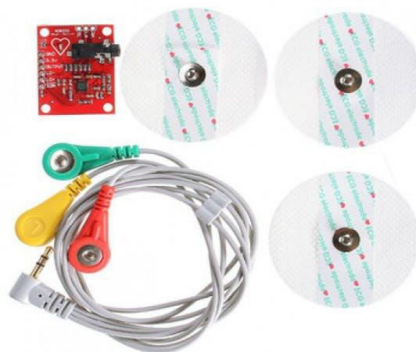
### HARDWARE ASPECTS

**ARDUINO UNO :-** is an open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Its hardware products are licensed under a CC BY-SA license, while software is licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially from the official website or through authorized distributors.



#### AD3282 ECG SENSOR

The AD8232 is a neat little chip used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram. Electrocardiography is used to help diagnose various heart conditions.



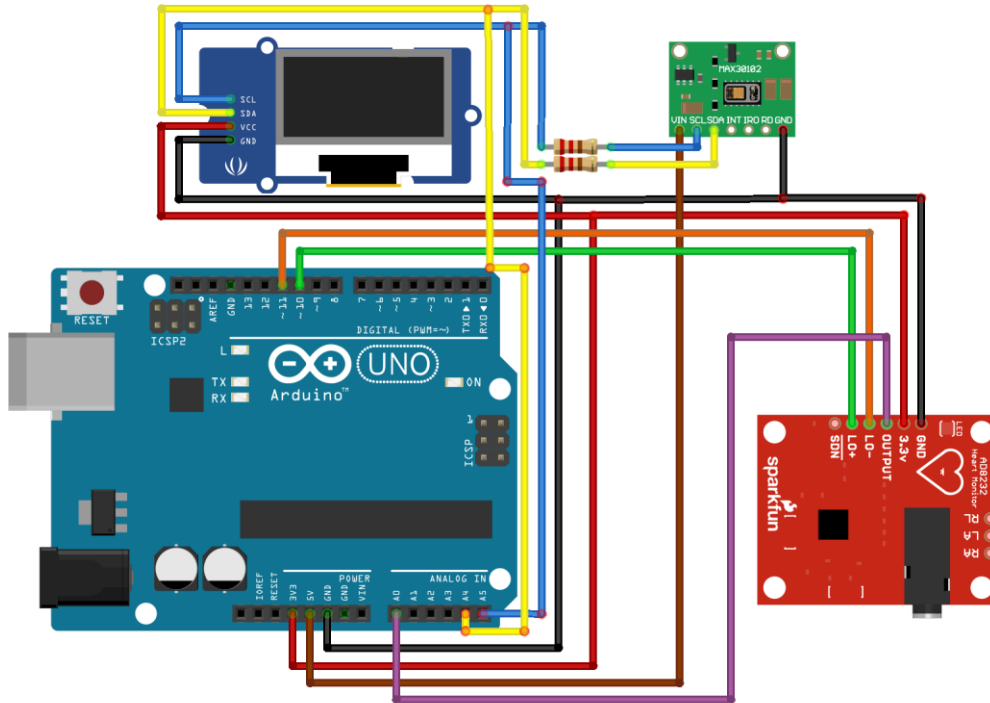
IC OLED :- This 0.91" I2C OLED Display is an OLED monochrome 128x32 dot matrix display module with I2C Interface. It is perfect when you need an ultra-small display. The driver IC is SSD1306 with the I2C interface. Comparing to LCD, OLED screens are way more competitive, which has a number of advantages such as high brightness, self-emission, high contrast ratio, slim outline, wide viewing angle, wide temperature range, and low power consumption. It is compatible with any 3V-5V microcontroller, such as Arduino.

### III. LITERATURE SURVEY

International research on vaccines and medicines in COVID-19 is underway by government organisations, academic groups, and industry researchers.<sup>[428][429]</sup> The CDC has classified it to require a BSL3 grade laboratory.<sup>[430]</sup> There has been a great deal of COVID-19 research, involving accelerated research processes and publishing shortcuts to meet the global demand.<sup>[431]</sup>

As of December 2020, hundreds of clinical trials have been undertaken, with research happening on every continent except Antarctica.<sup>[432]</sup> As of November 2020, more than 200 possible treatments have been studied in humans.

#### IV. PROPOSED SYSTEM



#### V. WORKING PRINCIPLE

The setup function initializes the OLED display and MAX30100 sensor. The current for RED LED of the MAX30100 sensor is set to 7.6 ma. However based on the sensitivity required these values can be changed by changing the value of RED\_LED\_CURRENT. See MAX30100\_Rawdata example for more details.

Initially the display reads "Please place your finger". Now, in order to detect the finger, IR readings from the sensor are used. The irValue variable stores the IR values from the sensor, if this value is below 7000, then that means their is currently no finger placed on to the sensor. Once the finger is detected the respective SPO2 and HR readings are shown on the display. The function **pox.getHeartRate()** is used to get the heart rate readings, and **pox.getSpO2()** is used to get the SPO2 readings. Another function **onBeatDetected()** is used to show the readings as well as display the bmp graphic of the heart on the side. Refer to MAX30100\_Minimal example for better understanding of the code.

##### Use of Matlab

Before running the Matlab code **make sure you have Signal Processing Toolbox, Wavelet Toolbox and the Arduino Package for Matlabis installed.**

Matlab is used in the following project to demonstrate how an ECG signal can be obtained from the Arduino and further used for any mathematical analysis. As a demonstration I have worked on a short program that can graph the R wave of the raw ECG signal obtained, using which one can easily calculate the heart rate. These readings are then sent to a website called **ThingSpaeak**. ThingSpeak is an IoT analytics platform service that allows users to aggregate, visualize, and analyze live data streams in the cloud.

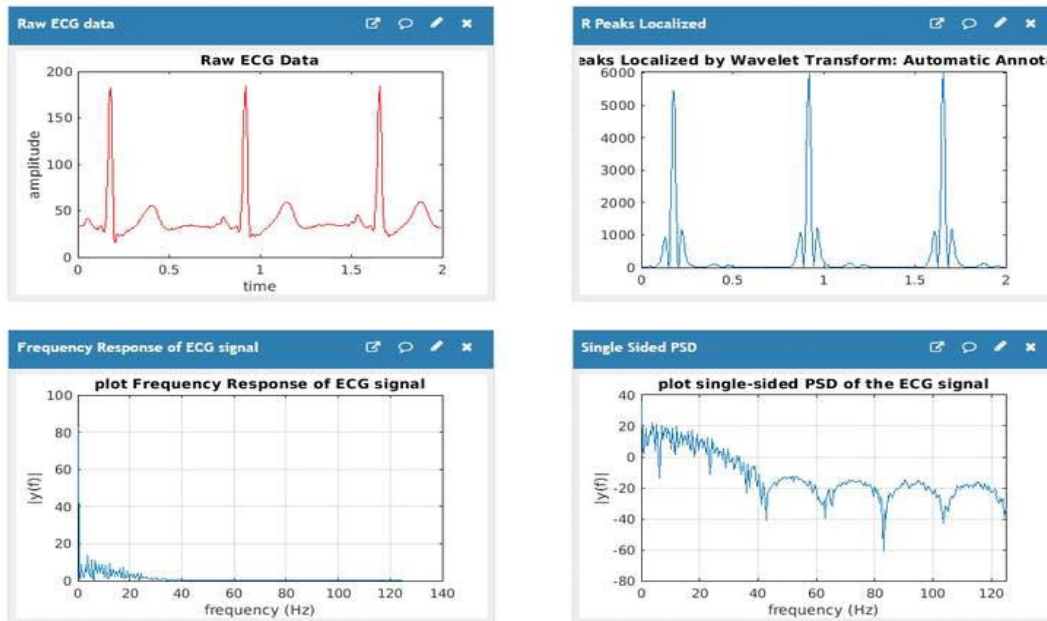
Another interesting way that Matlab can be used in this project is to filter a noisy ECG signal. Although this method is not needed in this project as the sensor used comes with an on board op amp to help filter the noise. However, if you are interested to know more about ECG signal filtering via Matlab then I would suggest this article "[Implement Notch Filter to remove 50 Hz on ECG signal - File Exchange - MATLAB Central \(mathworks.com\)](#)". Another method of filtering can be seen from this article "[Removing High-Frequency Noise from an ECG Signal - MATLAB & Simulink - MathWorks India](#)".

The Matlab data collected is sent to a ThingSpeak website where further analysis can be made. In this project, I have worked on 4 simple program that you can run on ThingSpeak to visualize the ECG data in 4 ways. The first program is a simply plots the ECG signal. Second program is to plot the R-R intervals. Third program shows the frequency



response of the ECG signal, this is helpful to detect noise in your signal. The last program shows the PSD (power spectral density) of signal, again helpful in verifying the integrity of the signal received.

## V. CONCLUSION



MATLAB includes thousands of built-in math, engineering, and plotting functions that you can use for your Arduino programming. **With MATLAB support package for Arduino, the Arduino is connected to a computer running MATLAB.** Processing is done on the computer with MATLAB.

## REFERENCES

1. Paderno A, Mattavelli D, Rampinelli V, Grammatica A, Raffetti E, Tomasoni M, et al. (December 2020). "Olfactory and Gustatory Outcomes in COVID-19: A Prospective Evaluation in Nonhospitalized Subjects". *Otolaryngology–Head and Neck Surgery*. **163** (6): 1144–1149. doi:10.1177/0194599820939538. PMC 7331108. PMID 32600175.
2. Chabot AB, Huntwork MP (September 2021). "Turmeric as a Possible Treatment for COVID-19-Induced Anosmia and Ageusia". *Cureus*. **13** (9): e17829. doi:10.7759/cureus.17829. PMC 8502749. PMID 34660038.
3. Niazkari HR, Zibae B, Nasimi A, Bahri N (July 2020). "The neurological manifestations of COVID-19: a review article". *Neurological Sciences*. **41** (7): 1667–1671. doi:10.1007/s10072-020-04486-3. PMC 7262683. PMID 32483687.
4. "Interim Clinical Guidance for Management of Patients with Confirmed Coronavirus Disease (COVID-19)". U.S. Centers for Disease Control and Prevention (CDC). 6 April 2020. Archived from the original on 2 March 2020. Retrieved 19 April 2020.
5. Jump up to:<sup>a</sup><sup>b</sup> Gao Z, Xu Y, Sun C, Wang X, Guo Y, Qiu S, Ma K (February 2021). "A systematic review of asymptomatic infections with COVID-19". *Journal of Microbiology, Immunology, and Infection = Wei Mian Yu Gan Ran Za Zhi*. **54** (1): 12–16. doi:10.1016/j.jmii.2020.05.001. PMC 7227597. PMID 32425996.
6. Oran DP, Topol EJ (September 2020). "Prevalence of Asymptomatic SARS-CoV-2 Infection: A Narrative Review". *Annals of Internal Medicine*. **173** (5): 362–367. doi:10.7326/M20-3012. PMC 7281624. PMID 32491919.
7. Lai CC, Liu YH, Wang CY, Wang YH, Hsueh SC, Yen MY, et al. (June 2020). "Asymptomatic carrier state, acute respiratory disease, and pneumonia due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): Facts and myths". *Journal of Microbiology, Immunology, and Infection = Wei Mian Yu Gan Ran Za Zhi*. **53** (3): 404–412. doi:10.1016/j.jmii.2020.02.012. PMC 7128959. PMID 32173241.



8. Jump up to:<sup>a</sup> <sup>b</sup> Furukawa NW, Brooks JT, Sobel J (July 2020). "Evidence Supporting Transmission of Severe Acute Respiratory Syndrome Coronavirus 2 While Presymptomatic or Asymptomatic". *Emerging Infectious Diseases*. **26** (7). doi:10.3201/eid2607.201595. PMC 7323549. PMID 32364890.
9. Jump up to:<sup>a</sup> <sup>b</sup> Gandhi RT, Lynch JB, Del Rio C (October 2020). "Mild or Moderate Covid-19". *The New England Journal of Medicine*. **383** (18): 1757–1766. doi:10.1056/NEJMcp2009249. PMID 32329974.
10. Byrne AW, McEvoy D, Collins AB, Hunt K, Casey M, Barber A, et al. (August 2020). "Inferred duration of infectious period of SARS-CoV-2: rapid scoping review and analysis of available evidence for asymptomatic and symptomatic COVID-19 cases". *BMJ Open*. **10** (8): e039856. doi:10.1136/bmjopen-2020-039856. PMC 7409948. PMID 32759252.
11. <https://www.hackster.io/>
12. <https://create.arduino.cc/projecthub/projects/>
13. <https://how2electronics.com/arduino-projects>
14. <https://www.watelectronics.com/arduino-projects>



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