

FACULTY OF INFORMATION TECHNOLOGY  
BRNO UNIVERSITY OF TECHNOLOGY



SEN  
Intelligent Sensors

Commissioning Heartbeat Sensor and Comparison  
Against Oximeter

# Contents

<b>1</b>	<b>Abstract</b>	<b>2</b>
<b>2</b>	<b>Introduction</b>	<b>2</b>
<b>3</b>	<b>Setup</b>	<b>3</b>
<b>4</b>	<b>Implementation</b>	<b>4</b>
<b>5</b>	<b>Conclusion</b>	<b>4</b>
<b>6</b>	<b>Appendix</b>	<b>5</b>
<b>7</b>	<b>References</b>	<b>6</b>

# 1 Abstract

The goal of this project is to demonstrate a method of heart beat measurement via infrared light. The next sections below, will describe further details, which were required to be done to the right functionality. The results of measurement were compared with a valid heart beat sensor, which measured heart beat in other way than the infrared method.

## 2 Introduction

The necessary facilities for the implementation of the project were:

- Device shown in Figure 1.

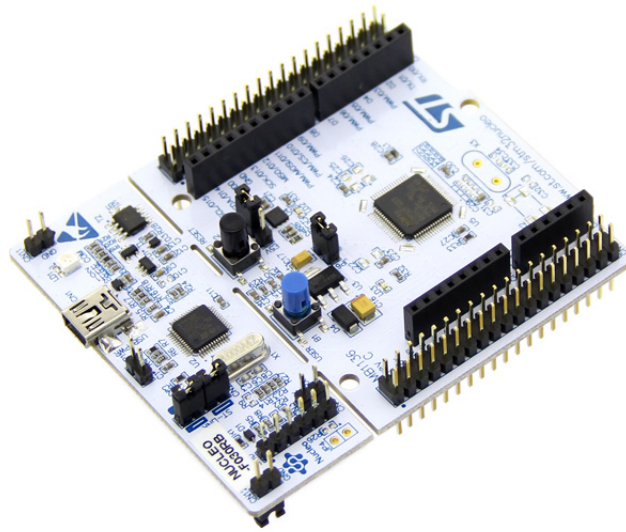


Figure 1: STM32 Nucleo board [2].

- Sensor shown in Figure 2.



Figure 2: Keyes KY-039 Finger Heartbeat Detection Sensor [1].

- Three female-to-female jumper wires.

The device shown in Figure 1 - NUCLEO-F030R8 [5], was the main platform for the project. The device was equipped with a STM32F030R8 [6] microcontroller unit (MCU), which was designed and made to be suitable for a wide range of applications. MCU includes a set of peripherals through which it communicates with other devices such as the sensor shown in Figure 2. To create a communication pipeline, these units must be connected to each other via jumper wires. Wires provide a connection between the pins of units and so the pins have to be configured correctly.

### 3 Setup

Firstly, the components must be connected to each other in a right way. Sensor, as a slave component shown in Figure 4, is connected to the main device (master component). These two units are connected via 3 jumper wires to the corresponding pins. The Figure 3 and 4 have three common marked pins: *GND* (orange), *5V* (yellow), *PA0* (green); by which they are connected together. *PA0* indicates an analog input pin to the master component. A precise description of all the necessary pins is shown in Figure 5.

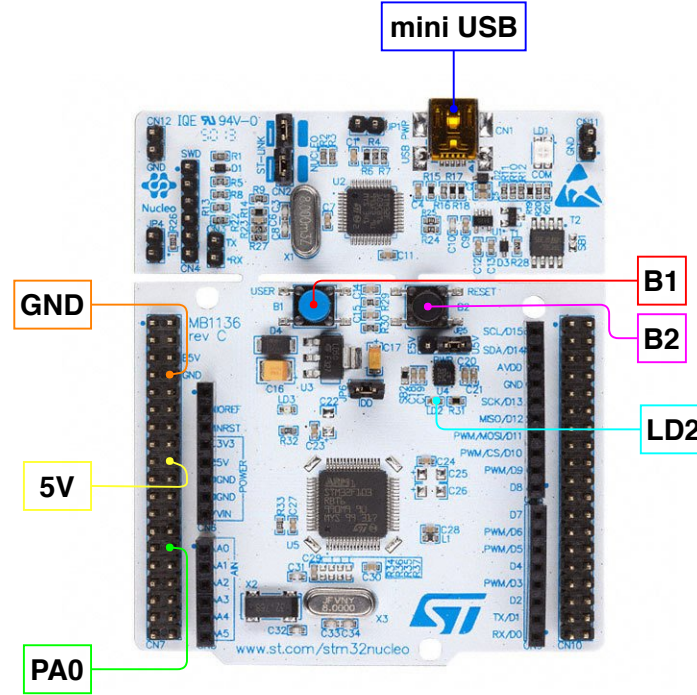


Figure 3: NUCLEO-F030R8 [3] connection scheme.

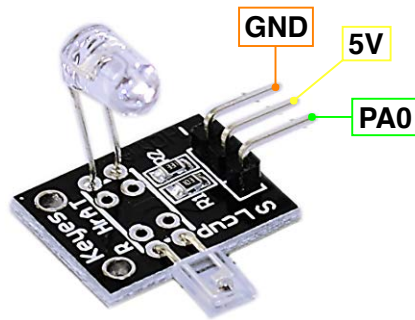


Figure 4: Keyes KY-039 [1] connection scheme relating to Figure 3.

<b>B1</b>	button 1
<b>B2</b>	button 2
<b>LD2</b>	LED 2
<b>GND</b>	ground
<b>5V</b>	5 volt voltage supply
<b>PA0</b>	pin PA0
<b>mini USB</b>	mini USB port

Figure 5: Explanatory notes.

After proper connection of devices, which are attached to the computer via mini USB port (see Figure 6), they are ready to be programmed.



Figure 6: Correct connection of devices.

## 4 Implementation

...sensor code[4]...

## 5 Conclusion

...

6    **Appendix**

<b>Name</b>	<b>Value</b>
n1	v1
n2	v2
n3	v3

Figure 7: Table of measurements.

## 7 References

- [1] *Keyes KY-039 Finger Heartbeat Detection Sensor*. [Image; Online; Accessed: 2018-10-07]. Retrieved from: [https://images-na.ssl-images-amazon.com/images/I/71MfNkRMYDL.\\_SX425\\_.jpg](https://images-na.ssl-images-amazon.com/images/I/71MfNkRMYDL._SX425_.jpg)
- [2] *STM32 Nucleo board (NUCLEO-F030R8)*. [Image; Online; Accessed: 2018-10-07]. Retrieved from: <https://statics3.seeedstudio.com/images/product/NUCLEO-F030RB.jpg>
- [3] *STM32 Nucleo board (NUCLEO-F030R8) - front*. [Image; Online; Accessed: 2018-10-07]. Retrieved from: [https://media.digikey.com/Photos/STMicro%20Photos/MFG\\_NUCLEO.jpg](https://media.digikey.com/Photos/STMicro%20Photos/MFG_NUCLEO.jpg)
- [4] Luboš M.: *Arduino senzor tepu srdce*. 2016-12-13. [Online; Accessed: 2018-09-28]. Retrieved from: <https://navody.arduino-shop.cz/navody-k-produktum/arduino-senzor-tepu-srdce.html>
- [5] STMicroelectronics: *NUCLEO-F030R8*. [Online; Accessed: 2018-10-07]. Retrieved from: <https://os.mbed.com/platforms/ST-Nucleo-F030R8/>
- [6] STMicroelectronics: *STM32F030R8*. [Online; Accessed: 2018-10-07]. Retrieved from: <https://www.st.com/en/microcontrollers/stm32f030r8.html>