

Design Laboratory

Project Smartwatch



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1. Project goal:

The purpose of this project was to create a simplified smartwatch using Adafruit Clue with additional module MicroBit:BitWear. Our main goal to achieve was to implement some basic functions like real time clock, alarm, step-counter, Bluetooth connectivity and music player. We wanted the smartwatch to work without any external voltage supplier (without connecting to the Desktop/Laptop).

2. Description

In order to start using a smartwatch, the first thing needed to do is connect it to the Bluetooth device. Smartwatch is able to connect to the device with iOS.

Secondly, you need to set the actual time, in order to make it simpler, there is a field with flashing number which is pointing to the changing position. To accept setted time, make up gesture with hand. Now, the main screen with a clock should be able to see. In order to change the actual screen, you need to make a gesture to the left or right with your hand.

On clock screen it is possible to set the alarm, it can be done with pressing button B, after that, screen with setting time should appear again. After setting the clock alarm, confirm it with up gesture. When the alarm is ringing, long press button A to turn it off.

Next available screen is pedometer screen, it shows the amount of the steps made by the user. Steps are counted constantly during the work of the smartwatch, independently on actually presenting screen. It is possible thanks to the LSM6DS33 accelerometer/gyroscope sensor.

There is also a possibility of managing a music player with the next screen. Bluetooth connection allows to control multimedia playing on iOS device.

There are also two additional features:

- after 30 seconds of inactivity screen becomes darker in order to save battery
- smartwatch detects movement of user's hand and turns off screen when it is not used

Clue board is connected with Micro:Bit BitWear board. It enables using the vibration motor and sound speaker which are useful to make clock alarm.

Counting the time is realized with a timer, which controls board working time. When timer state increases by one, program changes the actual time (increments second).

3. Problems

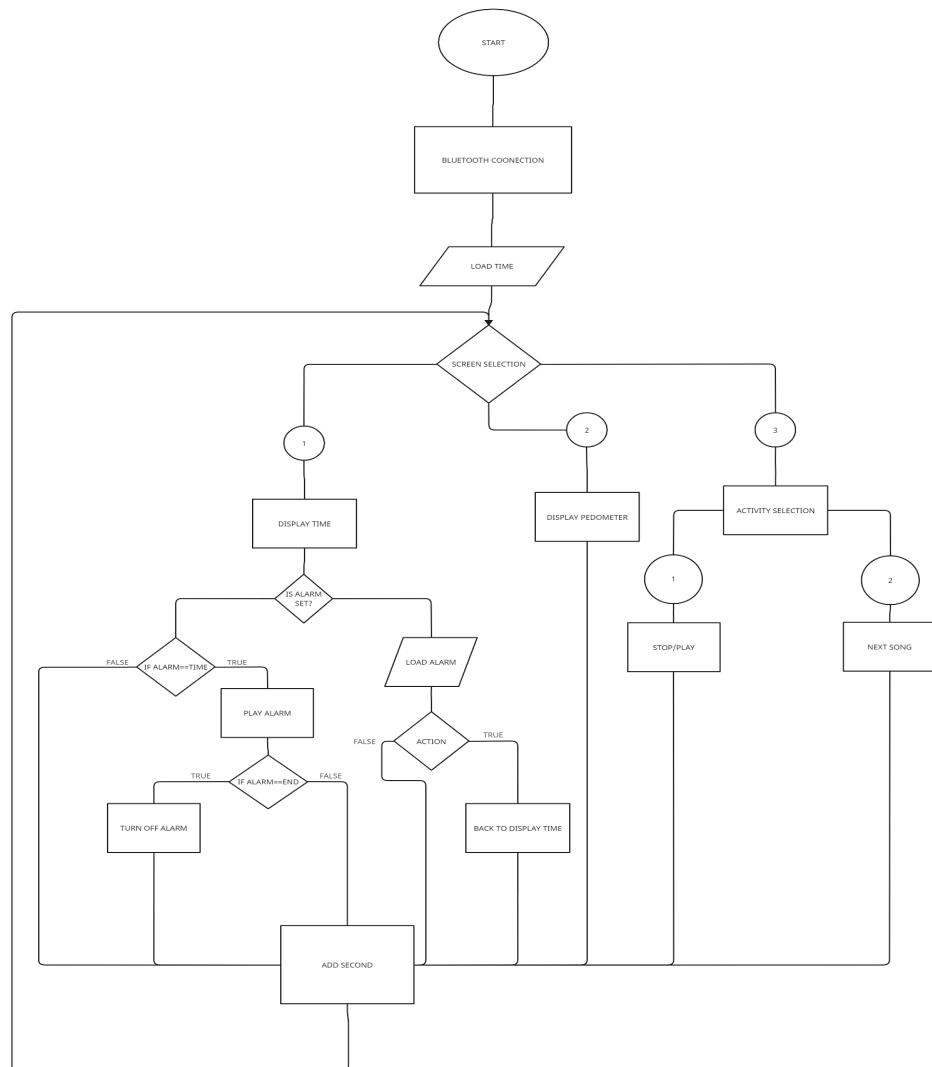
The whole project was written by using CircuitPython.

To make use of the additional BitWear board and provide Bluetooth connection, it is necessary to import an additional libraries which allow to control pins and Bluetooth module of Clue board.

During the work we have occurred some problems with memory allocation which sometimes were tough to solve, but as often as not, resetting Clue board was the solution. In some cases we needed to learn how to manage the displaying images or shapes on screen because they were causing problems with memory too.

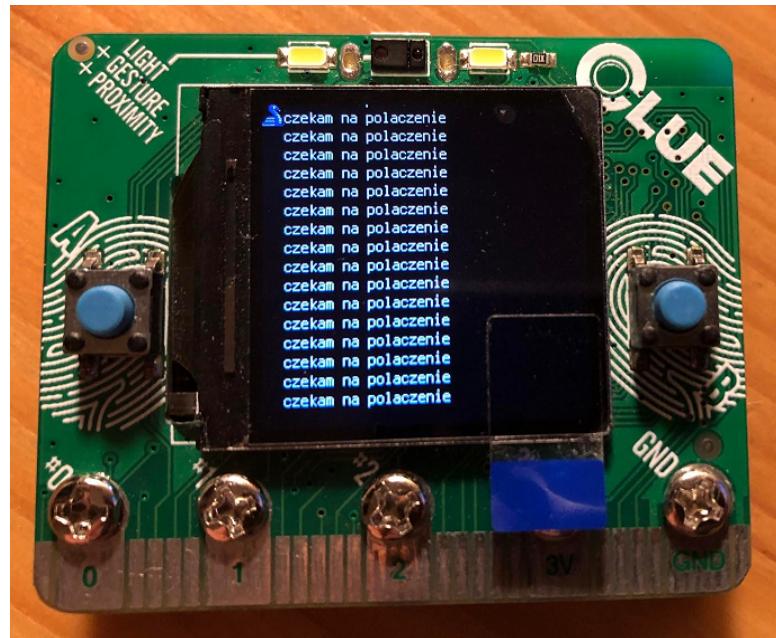
To work faster and more aware we used Mu Editor which provides serial console. It is helpful when comes to debugging or seeking for errors.

4. Block diagram



5. Work presentation and user's guide

- a) Bluetooth connection - for the smartwatch to start working, you need to connect to it via bluetooth. Your device must have an IOS system.



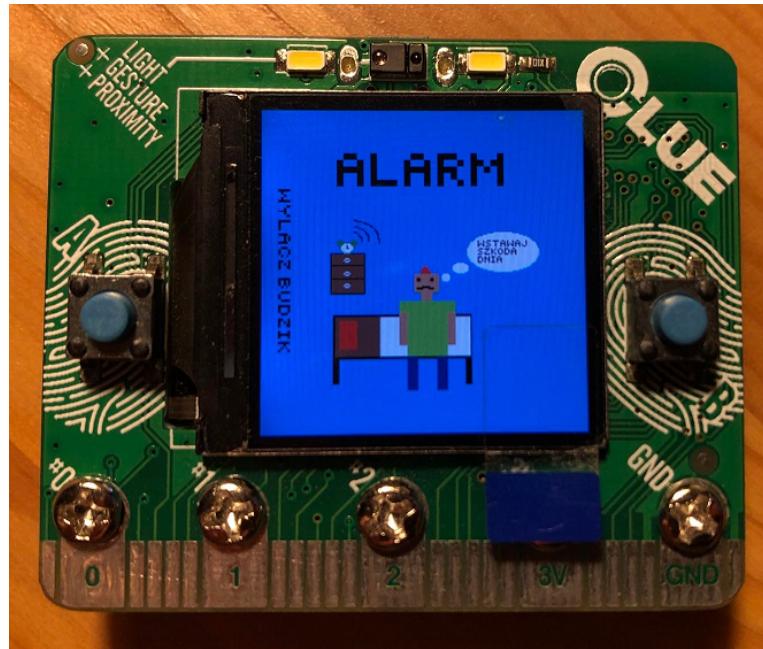
- b) Set time - the second thing you have to do is setting the current time using the side buttons. With the left button you change the position of the digit, with the right button the number you are currently on. The last number on the screen shows the current location of the position.



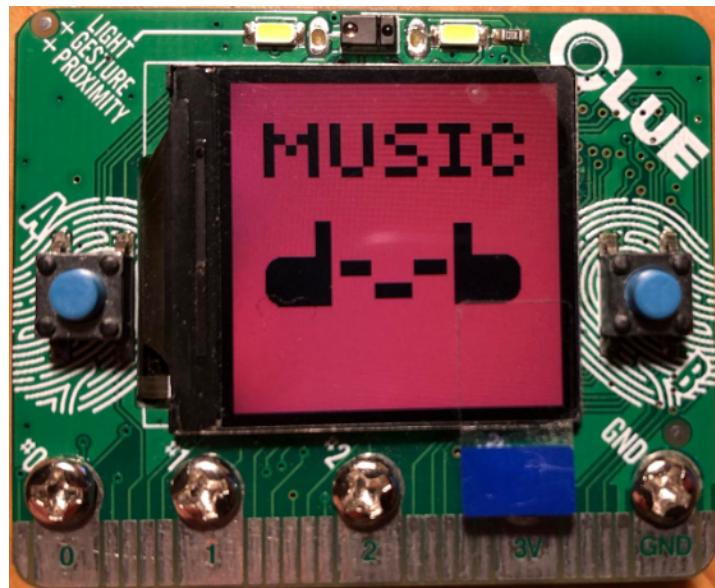
- c) Actual time - this is the main screen, which shows actual time. You can change this screen with your hand. Gesture to the left changes screen to the step counter, gesture to the right changes screen to the music player.



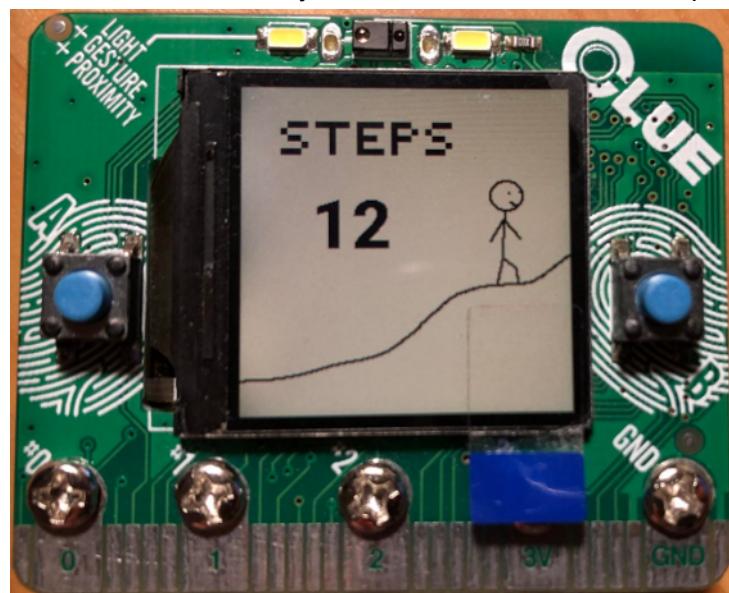
- d) Alarm - while on the actual time screen you can set the alarm, with the right side button. Setting is analogous to the setting time in point b). Alarm will sound, vibrate and screen will change. If the alarm rings, you will be able to turn off using the left side button.



- e) Music player - is responsible for controlling multimedia. There are two possible actions:
- play/pause
 - play next song



- f) Step counter screen - on this screen you can see the amount of steps that you made



6. GitHub

<https://github.com/DominikBudzynski/DesignLaboratoryEiT>