Heart Rate Monitor

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Current Market

1. IoT devices that send bulk data to servers, where analysis is done
2. Computer-based device (in-hospital)

Solution

ECG device powered by Edge Impulse without internet-dependency

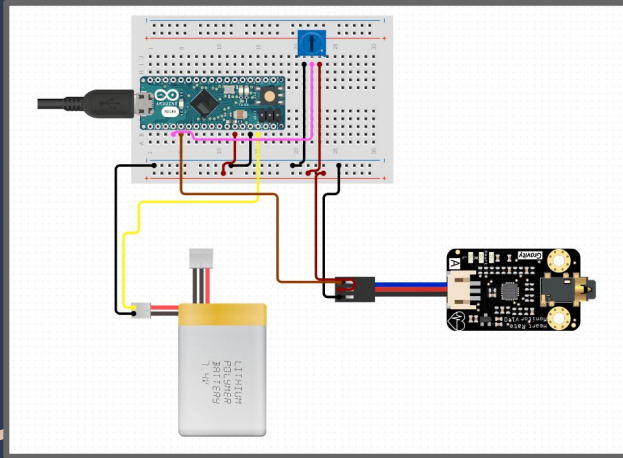15Kb - can be run on basically any microcontroller

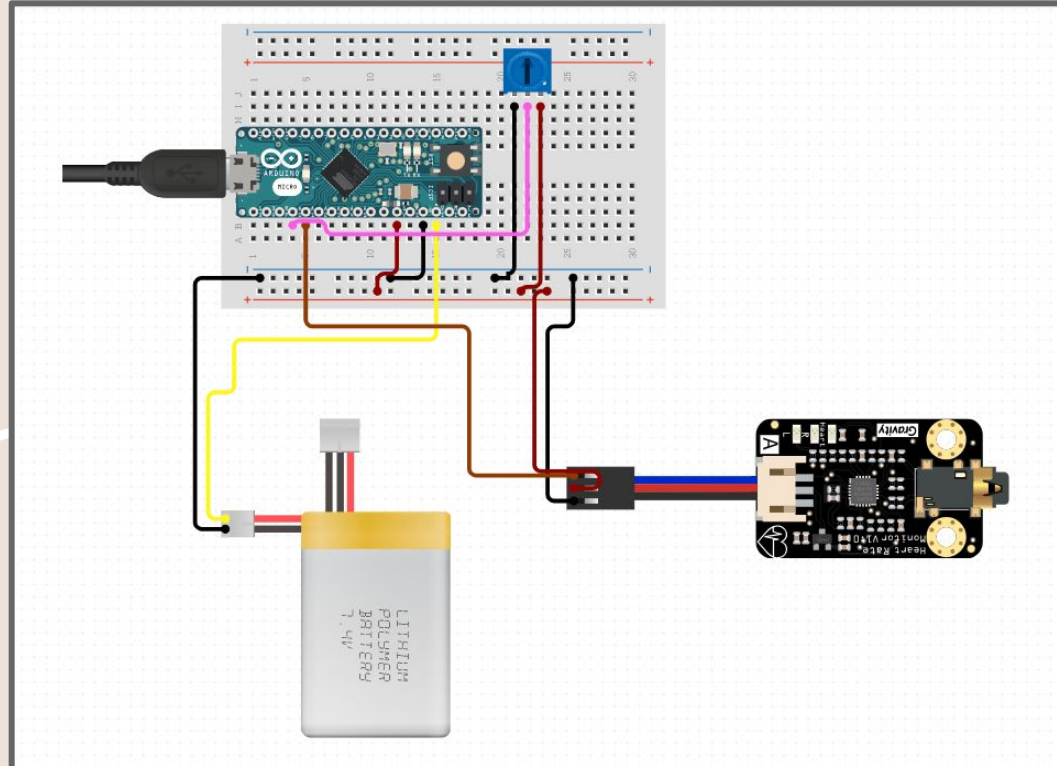3 outputs/ alert options

Normal

Atrial Fibrilation

Heart-Block

Hardware

- Arduino Nano
- DFrobot ECG sensor module
- ECG Electrodes (3x)
- Power Supply
- Connecting Wires

Schematic

ECG

An ECG is a paper or digital recording of the electrical signals in the heart. It is also called an electrocardiogram or an EKG. The ECG is used to determine heart rate, heart rhythm, and other information regarding the heart's condition. ECGs are used to help diagnose heart arrhythmias, heart attacks, pacemaker function, and heart failure.

ECG Signal Parameter
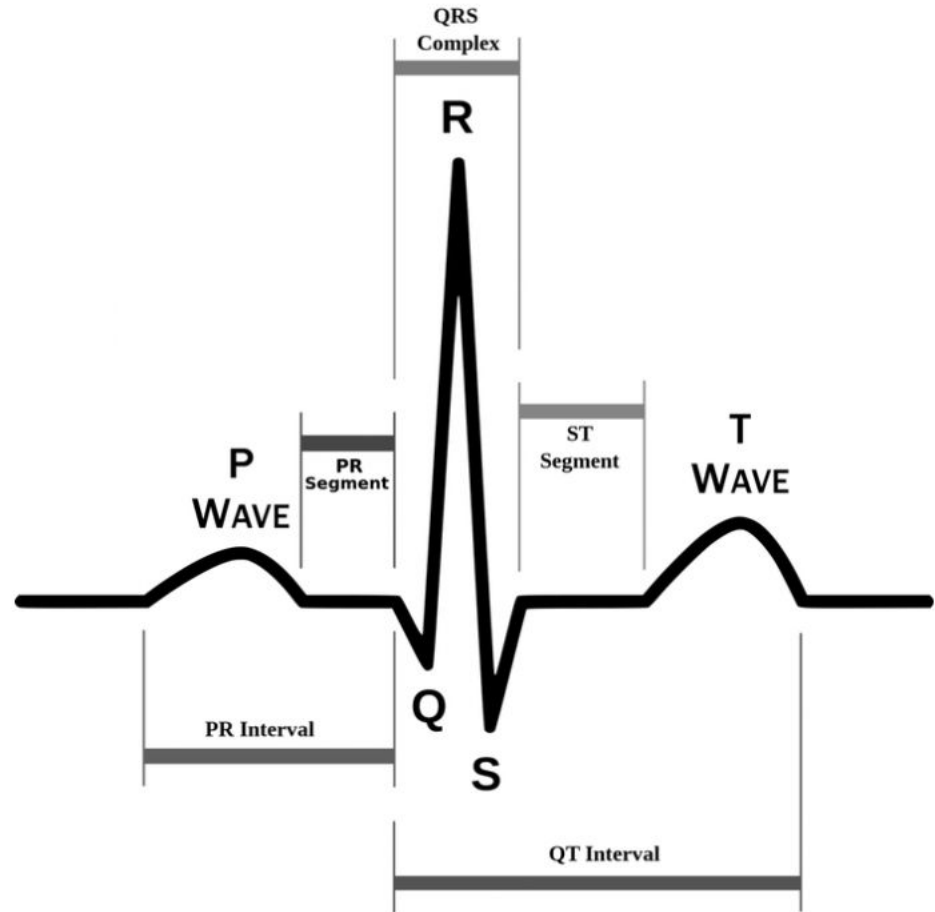
Abnormal HR Indicators

Blockage
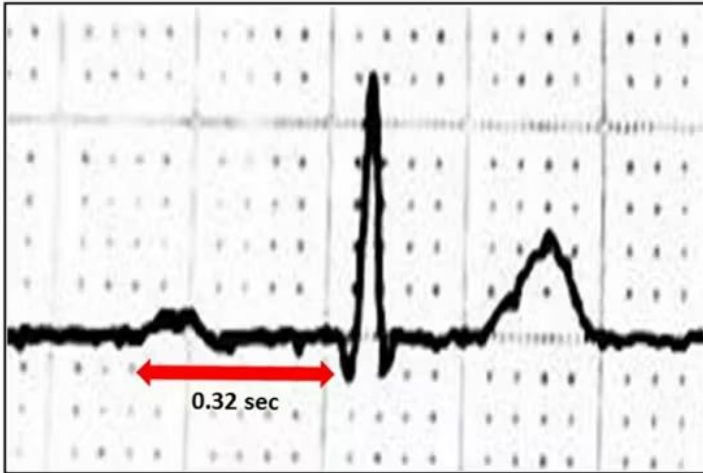
Atrial Fibrillation

Phase Duration Amplitude

P Wave 0.06-0.11 <0.25 PR

Interval 0.12-0.20 -

PR Segment 0.08 -

QRS Complex <0.12 0.8-1.2

ST Segment 0.12 -

QT Interval 0.36-0.44 -

T Wave 0.16 <0.5

Abnormal Parameter Effects on Heart:

Short/Long QT Interval

Flat or inverted T waves

Peaked T-wave, Long PR, QURS wide, QT short

Prominent U-waves

Increased/decreased rate

Increased QRS

(Initial) Model

Dataset

[MIT BIH Arrhythmia Database](#)

Classification

Due to the imbalanced data (common in that problem) between N class and anomalies class (SVEB, VEB, F). In *train.py* a classifier that adjust the weight for loss computation during training step is defined.

Next Steps

- **Consolidate module onto one PCB/enclosure**
- **Same experiment/lab but with the Particle Argon**
- **Integrate messaging platform to send alerts based on the 3 codes (normal/ x2 abnormal)**