Mini Project Report: Heartbeat Monitoring using Arduino (Virtual Simulation)

Title: Heartbeat Monitoring using Arduino (Virtual Simulation)

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1. Introduction

This mini project focuses on simulating a heartbeat monitoring system using the Arduino Uno microcontroller and a function generator in a virtual environment. The project demonstrates how biomedical signals like heart rate can be read and processed using basic electronics and programming, all without the need for physical hardware. This serves as a practical introduction to biomedical instrumentation and IoT-based health monitoring systems.

2. Objective

To simulate a heartbeat monitoring system using Arduino by generating a fake pulse signal through a function generator and displaying it on the Serial Monitor in Tinkercad.

3. Components Used

Component	Quantity	Purpose
Arduino Uno	1	Microcontroller to read and display data
Function Generator	1	To simulate a heartbeat waveform
Jumper Wires	Few	To connect components virtually
Tinkercad (online)	-	Simulation environment

4. Simulation Platform

- **Platform Used:** Tinkercad Circuits (https://www.tinkercad.com/)
- **Mode:** 100% virtual simulation
- **No physical hardware used**

5. Circuit Diagram

Step-by-Step Wiring Instructions

Function Generator Terminals in Tinkercad

Terminal	Label on Device	Meaning
+	Positive Terminal	This is your signal output
−	Negative Terminal	This is ground (GND)

Connect the Function Generator to Arduino:

From (Component)	Pin	To (Component)	Arduino Pin	Purpose
Function Generator	+	Arduino UNO	A0	Sends simulated pulse signal
Function Generator	−	Arduino UNO	GND	Ground to complete circuit

Visual Explanation (Simple Diagram)

Function Generator (➕) --------→ A0 (Arduino)
Function Generator (➖) --------→ GND (Arduino)

No need to connect 5V here since the generator is powered internally by Tinkercad's simulation engine.

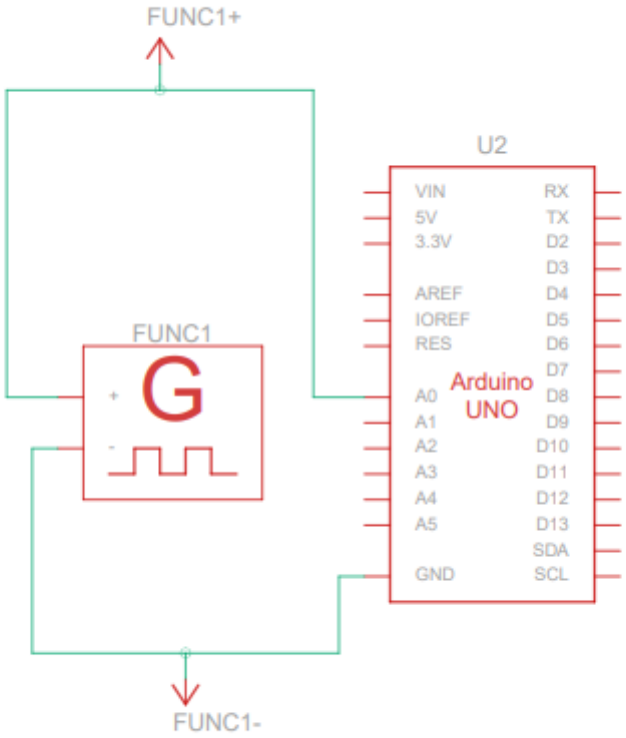

Fig 1: Circuit Diagram

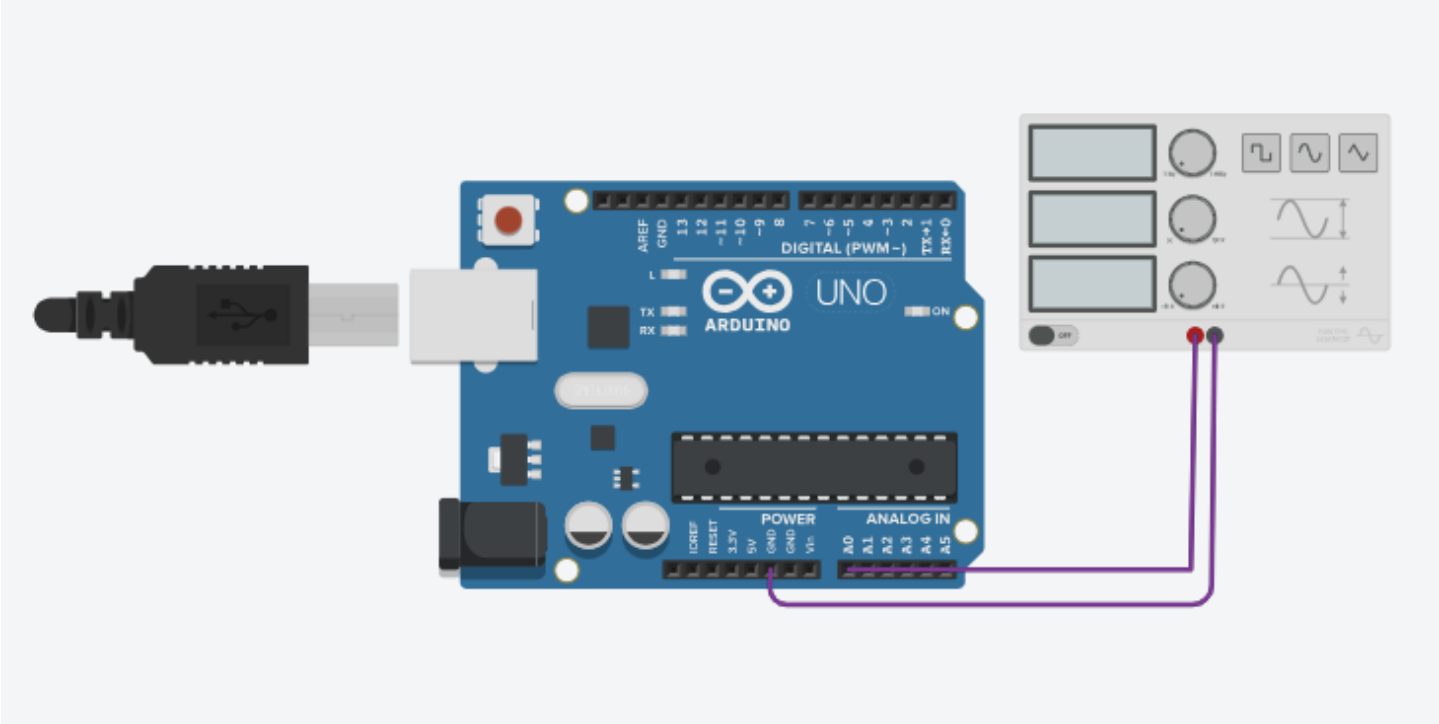

Fig 2: Arduino Circuit

6. Arduino Code

```
int pulsePin = A0;
int pulseValue = 0;
void setup() {
  Serial.begin(9600);
}
void loop() {
  pulseValue = analogRead(pulsePin);
  Serial.println(pulseValue);
  delay(10);
}
```

7. Output

The output was viewed in the Serial Monitor of Tinkercad, displaying real-time analog values simulating heartbeat signals.

Sample Output:

530

552

610

598

502

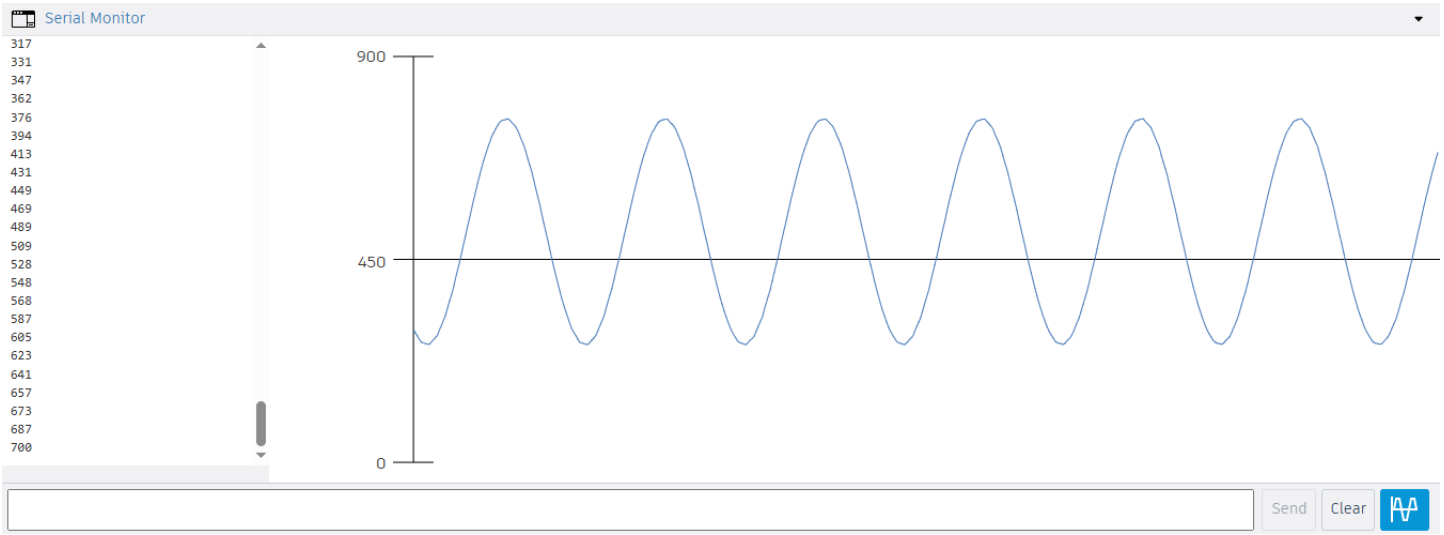

Fig 3: Output in Serial Monitor

8. Conclusion

The heartbeat monitoring system was successfully simulated using Arduino and a function generator in Tinkercad. It effectively mimicked a real biomedical signal and demonstrated data acquisition and monitoring

techniques. This project enhances understanding of how physiological signals are captured and processed in real-world biomedical applications.

9. Future Scope

- Add code to calculate real-time Beats Per Minute (BPM)
- Use real Pulse Sensor for practical implementation
- Display heart rate on an OLED screen
- Send data to mobile apps via Blynk (IoT integration)
- Include signal filtering and noise reduction

10. References

- https://www.tinkercad.com/
- https://www.arduino.cc/
- Online tutorials and documentation on Arduino and Pulse Sensor integration

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