

Lab 1: Sensors And Actuators

Wireless Communication Systems: ENGG 4200

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1 Sound Sensor (Sensor 1)

1.1 Graph Results

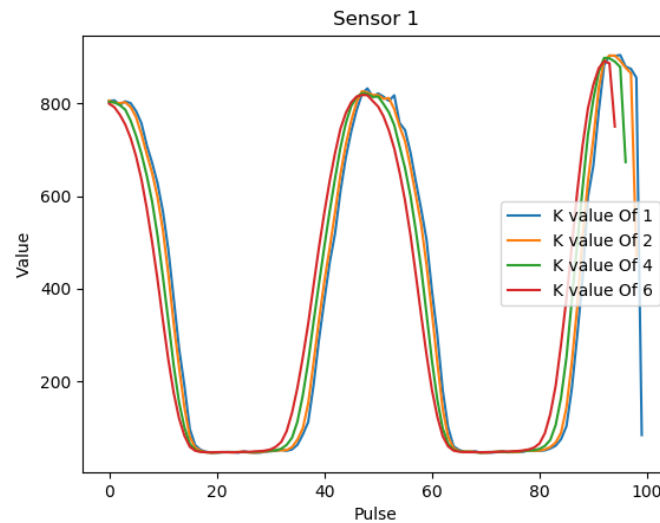


Figure 1: Sensor 1 Graph

1.2 Sensor Analysis

1.2.1 Sensor Classification (Question 3)

This is a passive sensor, as it requires a sound vibration to activate. Sensor detects sound using vibrations which causes the thin film of the electret to vibrate. This causes change in capacitance therefore produces a change in voltage. Sensor produces both analog and digital signals but circuit is an analog circuit.

1.2.2 Application (Question 4)

- Home Automation: Sound sensors can be used to automate applications in households. Such sensor can be used to control systems in homes. Systems include air conditioner, coffee machine, lights, and music players. Using a sound sensor in homes can allow user to turn on lights without getting off the bed in the morning.
- Audio Amplifier: Sound sensors can be used to amplify output in speakers. This sensor can be used as a feedback system to determine how much the outputted sound from the speakers needs to be amplified. This will depend on the user requirements.

2 Humidity and Temperature Sensor (Sensor 2)

2.1 Graph Results

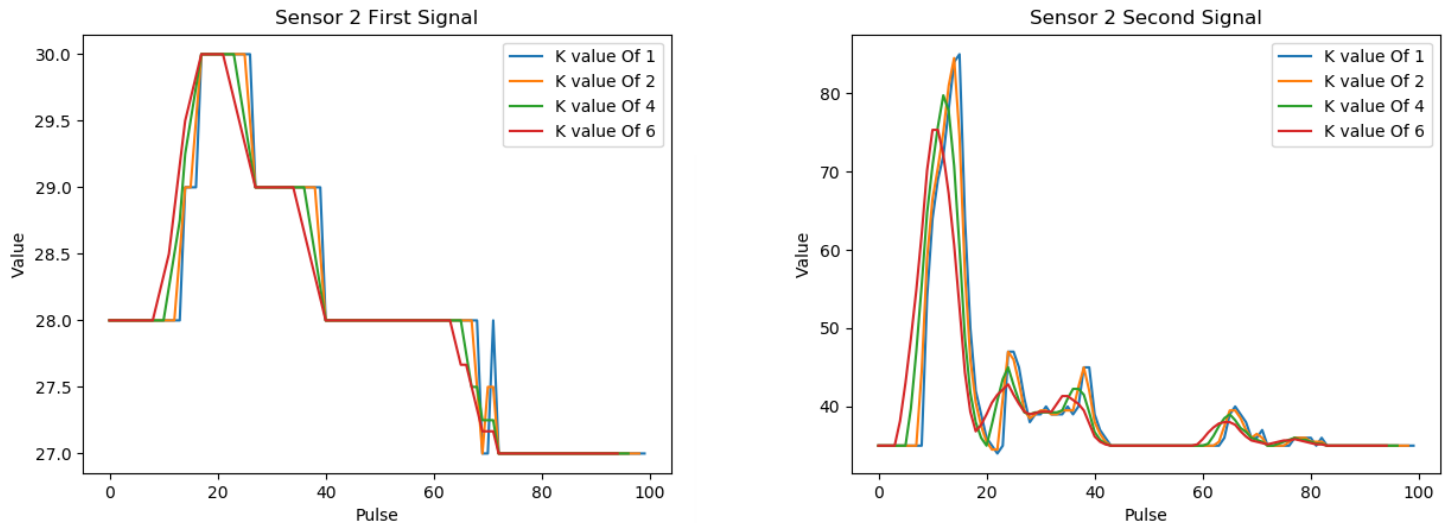


Figure 2: Sensor 2 Graph

2.2 Sensor Analysis

2.2.1 Sensor Classification (Question 3)

This sensor is a passive sensor. There are active sensors available in market. The three basic types of humidity sensors are capacitive, resistive and thermal. This specific sensor uses a capacitive humidity sensor and a thermistor to produces a digital signal. Conversion phenomenon is thermoelectric.

2.2.2 Application (Question 4)

- **Farming:** A humidity and temperature sensor can be used to ensure that plants can grow in perfect environment. Different plants need different temperatures and humidity level to nurture properly. Using such sensor can provide users information about soil and air to ensure perfect conditions
- **Weather Forecast:** A humidity and temperature sensor can be used to provide information about the weather to the public. Such information is crucial to industries such as the transportation industry especially planes.

3 Ultrasonic Sensor (Sensor 4)

3.1 Graph Results

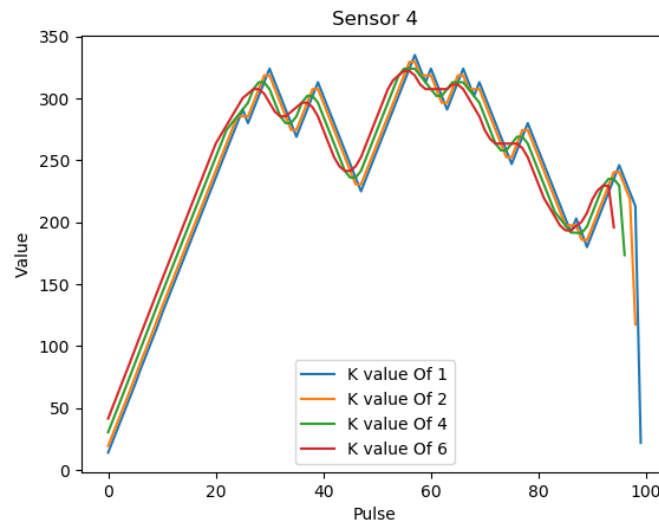


Figure 3: Sensor 4 Graph

3.2 Sensor Analysis

3.2.1 Sensor Classification (Question 3)

This sensor is a active sensor, but available in market as passive too. Conversion Phenomenon is Electromagnetic which uses ultrasonic waves as a mean of detection. Ultrasonic sensors provide both analog and digital outputs.

3.2.2 Application (Question 4)

- Anti-Collision Detection: Ultrasonic sensors can be used in cars to prevent collision or warn driver about surroundings. Such application can save lives and prevent accidents.
- Industrial Plants: Ultrasonic sensors can be used in industrial plant applications such as pallet detection in forklifts and bottle counting on drink filling machines.

4 Water Sensor (Sensor 3)

4.1 Graph Results

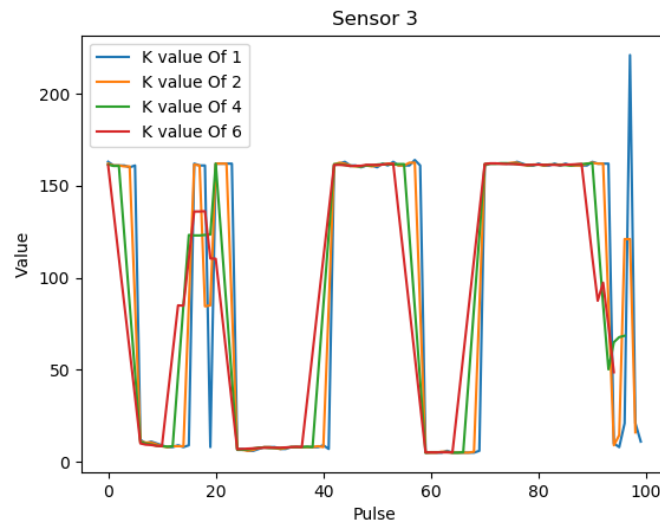


Figure 4: Sensor 3 Graph

4.2 Sensor Analysis

4.2.1 Sensor Classification (Question 3)

This water sensor is an passive sensor. The sensor outputs an analog signal. The conversion phenomenon is thermoelectric which uses electric means of detection.

4.2.2 Application (Question 4)

- Rainfall Sensing: A water sensor can be used to detect rainfall therefore activate specific systems that can utilize the rainfall for different uses. applications include closing a sunroof of a car or water and irrigation systems in gardens.
- Water leakage: A water sensor can be used to detect water leakage in different applications such as dishwashers, washing machines, water tanks, and more. Being able to identify source of water leakage can help prevent damage in application or save water costs.

5 Wireless System Description (Question 5)

A wireless system such as a water tank monitoring system utilizes 3 sensors. These sensors include a temperature sensor, ultrasonic sensor, and a water sensor. This system can monitor the depth of the water using the ultrasonic sensor, measure the temperature of the water using the temperature and humidity sensor, and a water sensor to detect when water runs out of tank. This system is utilized in industrial factories as it outputs useful data to monitor water usage.