Construction of an Altimeter Based on a Capacitive Barometer
(MW1-14)

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Introduction
In the recent years, usage of electronic device such as micro-robots, radio-controlled helicopters for rescue operation is increased in disaster such as earthquake due to its mobility and reliability. Some places in disaster area would be difficult to access and radio-controlled helicopters are used for searching survivors. After survivors are found, we are not only concern about the location but also the altitude. In order to measure the altitude accurately, an altimeter based on a capacitive barometer is developed. An altimeter based on a capacitive barometer makes use of the altitude-dependence of the barometric pressure. The change in the barometric pressure is detected by the altimeter leading to the subsequent change in capacitance of capacitive air pressure sensor of the capacitive barometer. The greater the altitude the lower the pressure. When the capacitive barometer is supplied with a calibration, it can indicate altitude.

Aim
This is a project in which we construct an altimeter based on a capacitive barometer, applying the altitude-dependence of the barometric pressure. It has a wide dynamic range and high signal-to-noise ratio and resolution better than anything currently available commercially.

Methodology
The altimeter based capacitive barometer is constructed in three parts, capacitance-to-voltage convertor circuit, a voltage-to-digital convertor circuit and user interface. The Capacitive air pressure sensor will detect the air pressure and change its capacitance. For the capacitance-to-voltage convertor circuit, it converts capacitance from detective capacitive sensor to voltage. The voltage to digital convertor circuit has Analog-to-digital convertor (ADC) and the MCU. ADC converts a continuous physical quantity (voltage) to a digital number that represents the quantity's amplitude. The result is a sequence of digital values that have been converted from a continuous-time and continuous-amplitude analog signal to a digital signal. The MCU is providing the clock signal to controlling the ADC and connected to digital screen to display voltage.

Implementation

System block diagram

The capacitive air pressure sensor developed at HKUST

The capacitance-to-voltage convertor circuit

Analog to digital convertor circuit pin with adapter on the printed circuit board

The digital screen and MCU connected to the voltage to digital circuit

Formation of whole circuit, the altimeter based capacitive barometer

The detective circuit output changes as the altitude changes

Digital screen shows voltage information