Preventing Elevated Indoor Carbon Dioxide Levels Using an Arduino Based IoT System

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Energy efficient homes, offices, and schools often have limited or non-existent means to bring in fresh air, resulting in high carbon dioxide levels. This can inhibit decision making skills and cognitive abilities, and also induce drowsiness, lethargy, and headaches. The consequences can be economically important since such effects can decrease productivity, especially in the context of offices and schools where carbon dioxide levels can be very high. Therefore, the objective of this project is to address this problem by ventilating the living space using existing exhaust mechanisms, without requiring changes in wiring. This was achieved by creating an Arduino based IoT system that monitors the indoor carbon dioxide levels by using an NDIR CO2 sensor, and turns on the exhaust fan using a smart switch, to bring in fresh air when the levels are high. The code was written in C using Arduino IDE software. In the code, the carbon dioxide levels are read from the sensor in hexadecimal format, and then translated to a readable PPM value. From this, a running average is calculated and used in the logic of the code. When the CO2 level exceeds a certain threshold, an IFTTT webhook is used to turn on the exhaust fan by sending a message to the smart switch via the cloud, and also send an email notification. When the CO2 level returns to acceptable levels, the fan is turned off. These two levels are separated by a hysteresis band to prevent frequent activation. To test the system, it ran through 60 trials on the basis of whether or not it executed the engineering goal. The system was successful in all 60 trials, and is therefore predictable and reliable.

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