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CALIBRATION OF HAZARDOUS GAS SENSORS INSTALLED ON MINI UNMANNED AERIAL VEHICLES

The question of the quality of the air in the work areas, nowadays, is quite acute, which is why there is a large number of studies in this direction. Many harmful and explosive gases, which cannot be smelled and may not be felt, but in high concentrations lead to industrial accidents or affect human health such as carbon monoxide that can quickly lead to death.

Air analysis of the content of harmful gases is required in the air of the working zone - where there are specific sources of harmful substances. For example, in the air of boiler houses it is often possible to detect excess concentrations of carbon monoxide and nitrogen oxides, and in the air of sewage pumping stations hydrogen sulfide or ammonia could be repeatedly exceeded. In such working conditions, sources of gases leakage could often be found in hazardous or inaccessible places [1]. That is why it is important to introduce a reliable mobile detection system for dangerous gases to prevent such problems.

A variety of conditions and features of production requires different scenarios of monitoring and control planning. In this case, the detection system must meet certain requirements, specifically: autonomy, reliability, accuracy, easy deployment on the place. In addition, it is compulsory that there should be remote control [3].

Mini unmanned aerial vehicles (UAVs) were selected as a platform for the system that is under study. In general, today mini UAVs have a wide range of applications and have several benefits over ground mobile systems:

- Are better suited for implementation in the work environment, as they have a lower risk of causing an industrial accident;
- Have more flexibility in terms of maneuverability;
- Data collection and analysis area is wider compared to ground systems, because certain gases are lighter than air and cannot be detected by the systems on wheels.

Nevertheless several disadvantages must be highlighted, such as:

- Less load-carrying capacity compared to terrestrial mobile systems; [2]
- Certain structural difficulties are encountered in the collocation of gases sensors due to obstacles such as, for example, air streams generated by UAV screws.

The connection, programming and calibration of sensors will be carried out with the hardware computer platform Arduino YUN. It was selected because it can be used both to create standalone interactive objects and to connect to software that runs on the computer.

Calibration of gas sensors will be carried out with the Arduino IDE and MATLAB software. The speed of the sensor response to change of the gas environment and the accuracy of the indicators will be checked. Each of the selected sensors will be connected

to the Arduino YUN according to the scheme shown in Figure 1, and then a software code will be developed for checking the specified parameters.

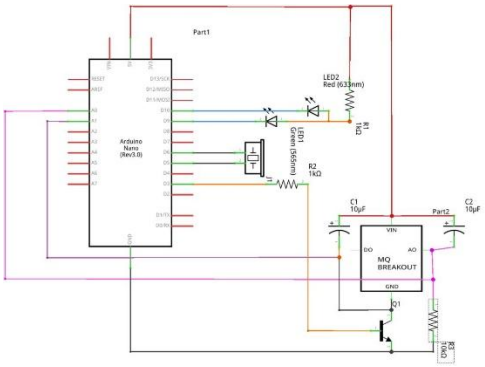

Fig. 1. Diagram of connection of gas sensors for further calibration

It is planned to carry out an experimental confirmation of the efficiency of the proposed scheme and to calibrate the target gas sensors in the future.

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