

Сур.4. Жинақталған пьезомодулі бар көпқызметті пьезодатчик: ТСПЭ – термосезімтал пьезоэлемент, М-мембрана

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## DEVELOPMENT OF AIR POLLUTION SENSING SYSTEM USING ARDUINO

**Abstract.** The thesis describes the development of a system that is able to determine the quality of the air in the streets of Almaty, as well as has the ability to show statistics, and monitor the air. People do not think about the quality of the air in the streets, when working or walking. Often we do not notice how dirty the air, and this can lead to many diseases.

**Key words:** system, air, ecology, statistics, air quality, technology.

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**Аңдатпа.** Мақалада Алматы қаласының күнделікті ауа-райын және ауаның сапасын өлшеп, мәліметтерді WiFi арқылы вебсерверге жібереді. Сайт арқылы қолдаушы жергілікті ауа-райын және сапасын онлайн түрде қарай алады. Бұл құрылымның тигізетін пайдасы өте зор. Себебі қазіргі таңда адамдар жұмыс кезінде немесе серуендеп жүргенде ауаның қаншалықты лас екенін елемейді. Уақыт өте келе бұл әртүрлі ауруларға шалдығуға әкеледі.

**Кілт сөздер:** жүйе, ауа, экология, статистика, ауа сапасы, технология.

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**Аннотация.** Данная статья описывает разработку системы определения уровня загрязнения воздуха, которая способна определять качество воздуха на улицах города Алматы, а так же имеет возможность показывать статистику по этой проблеме. Люди не задумываются о качестве воздуха на улицах, когда работают или же гуляют. Часто мы не замечаем насколько загрязнен воздух, и это может привести ко многим болезням.

**Ключевые слова:** система, воздух, экология, статистика, качество воздуха, технологии.

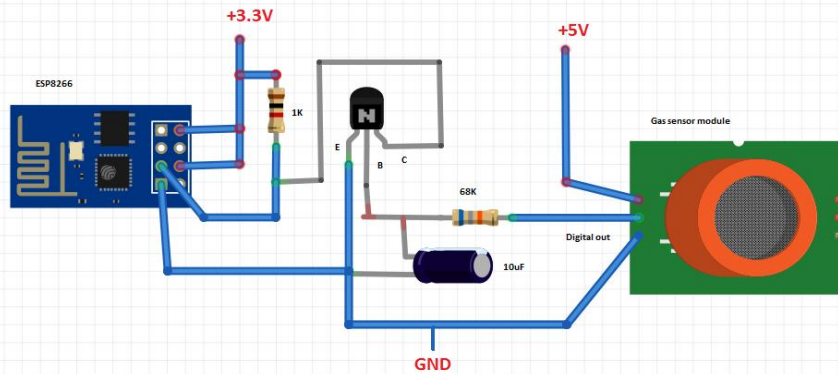
### *Introduction*

Air pollution is a major concern in modern cities and in developing countries nowadays. Atmospheric pollutants such as CO<sub>2</sub>, NO<sub>2</sub>, CO, O<sub>3</sub>, SO<sub>2</sub>, Suspended Particulate Matter (SPM), Respirable Suspended Particulate Matter (RSPM) and Volatile Organic Compounds (VOCs) have a direct impact on the human health; they are responsible for a variety of respiratory illnesses (such as asthma) and can cause cancer in humans if they are exposed to these pollutants for extended periods of time. As an instance, carbon monoxide is highly toxic to humans as it can cause severe headaches, asphyxiation due to formation of carboxyhemoglobin and even death if exposed for prolonged time.

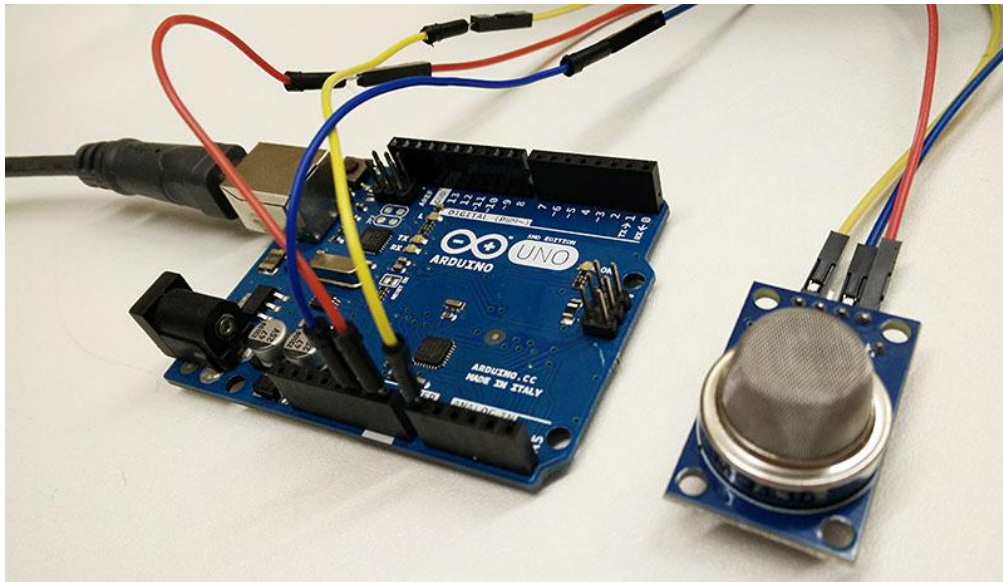
Air quality monitoring by monitoring stations. Nowadays, air pollution is monitored by static air quality measurement stations that are operated by official authorities. These stations are highly reliable and can measure the pollutants in air to a high level of accuracy and precision using analytical instruments, such as mass spectrometers. However, extensive cost of acquiring and operating such stations limits the number of installations.

The concentration of air pollutants such as CO<sub>2</sub>, CO, SO<sub>2</sub>, etc. is highly location-dependent. The urban areas with heavy traffic concentration and industrial areas have a considerable impact on the local air pollution. Since the air pollution monitoring stations are costly and so are limited in number, we have come up with AMS (Air Monitoring System). which is a small and portable measurement system which includes various gas sensors (such as CO, CO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, etc.) and microcontroller that can be used by a number of people. We have also devised a software for collecting the data from the AMS and plotting it in real-time. Thus AMS can provide the user with:

- Low-cost and low-power measurement hardware that is suitable for mobile
- measurement;
- User-friendly data collection and processing software;
- Gathering high quality data [1].



Use gas sensor digital output and connect it to ESP8266 GPIO2 pin. Because **ESP8266** operates on 3.3V and gas sensor operates on 5V we will add additional NPN transistor, two resistors and capacitor for voltage level sifter [2].



Connection

### Conclusion

The goal of this thesis was to develop a working prototype, which would be able to determine quality of the air, gas amount and automatically clean the air in the placement. The thesis itself provides the project overview. It starts with some background information about foreign and domestic analogues. It then goes on to describe Arduino and presents features of microcontrollers from the point of view of an engineer. Then the thesis

describes overall architecture of the Air Monitoring System, covers some of the technically challenging or otherwise interesting features that have been implemented and concludes with the testing techniques used in development. Development of a Air Monitoring System, which uses spectral sensors, is a complex task. It is especially complex in the case of minimization of end device's size.

The actual development of the project allowed implementing about 2/3 of the initially planned features. The resulting product is still able to demonstrate the basic functionality of the Air Monitoring System.

### **References**

1 About AirCasting [internet resource].-URL: <http://aircasting.org> (date of use: 05.04.2017).

2 Webopedia: Online Tech Dictionary for Students, Educators and IT Professionals [internet resource].-URL: <http://www.webopedia.com> (date of use: 05.04.2017).