Journal of Artificial Intelligence and Data Science (JAIDA) **Vol. 1, No. 1, pp. 59-62, 2021**
Research Article

https://jaida.ikcu.edu.tr/

Social Distancing Automation Software Based on Cloud

Ali Şahin DEMİR [1], Sevcan EMEK [1,*]

[1] Manisa Celal Bayar University, Faculty of Engineering, Department of Computer Engineering, Turkey

Abstract

This study aims to follow the social distance between people working together in a workplace. It is extremely important to provide a healthy workplace by both employers and employees during the pandemic. One of the measures taken during the pandemic is to ensure social distance. In this study, an IoT (Internet of Things) based circuit design is created that measure the distance between people working together. Social distancing automation software has been developed that stores information of employees such as name, surname, identity id, and the department they work in the cloud. Measurements taken from the circuit, which will track the distance of the employees, can be transferred to the cloud with this automation application. Both employees and employers will be able to observe social distance tracking by providing access to the cloud.

Keywords: Cloud; IoT; social distancing automation.

1. Introduction

One of the first measures taken within the scope of the measures taken by occupational health and safety professionals in the workplaces within the scope of the coronavirus epidemic is to make transition markings in accordance with the social distance rule in the workplaces. However, apart from these markings, it becomes mandatory to take other health and safety precautions. It is necessary to reevaluate the working methods and forms by considering the social distancing rule in the workplaces and to make a work organization in accordance with this rule when possible [1]. For this reason, various applications, including social distancing management, are being developed [2-4]. In areas such as public transport, airports, shopping malls, schools, hospitals, tourist attractions, restrooms, office buildings, which are fast service areas, studies are observed for the use of technologies for social distance. Sensing technology solutions are implemented to help understand visitor traffic flow, crowd density management, and behavior. Time-based measurements are suitable for measuring the actions of people in a closed environment. In order to provide a healthy space environment, areas where customers are dense, are determined, and it is observed how far people are from each other. Applications such as conference room management, mass crowd management system, building automation based on real-time signal processing are being developed to manage social distance correctly. Companies looking to improve people counting, crowd monitoring, industrial security, and other applications use sensor technology for real-time decision making and signal processing [5]. Within the scope of this study, it is planned to achieve the following targets in large-scale production areas as a sector:

- Creating social intervals by measuring distances during the epidemic period
- To use personnel performance more efficiently
- Providing controlled access to production areas
- Protecting the safety of personnel in hazardous areas
- Perceiving the mobility with the report submitted to the personnel affairs department
- To ensure that the system works integrated with other systems
- Analyzing the relationship of personnel-distance with the collected data.

This study is organized as follows: Section 2 explains the architecture of social distancing automation application between integrated circuit and cloud. Section 3 describes how to implement the model planned in this study. Conclusion section suggests that this planned study has the potential to be implemented in a real workplaces.

2. Methodology

The social distancing automation consists of desktop software and workstation software. Desktop software runs on the host computer under the control of the administrator. All reporting, personnel information, and settings are provided by desktop software. The workstation software is carried out under the control of the responsible personnel in different departments in the workplace. Multiple workstations can be set up in the workplace. Desktop software and station software are written by using Python programming language.

*Corresponding author e-mail address: sevcan.emek@cbu.edu.tr

Received: 17/07/2021; Accepted: 17/08/2021

The rangefinder is an integrated-based electronic circuit that measures ultrasonic sound, and it runs with external energy. Data is obtained by placing it in the areas where the distance should be measured. The controls used in the rangefinder are carried out with Arduino programming. The Dropbox web server, which provides a cloud storage service, is used to store the data. Personnel information stored in the cloud can be controlled by administrators with access permission. In desktop software which runs on the server and workstation software, all addresses where files are read and written are the physical address of the Dropbox. The relationship among server, workstation, rangefinder, and cloud is shown in Figure 1.

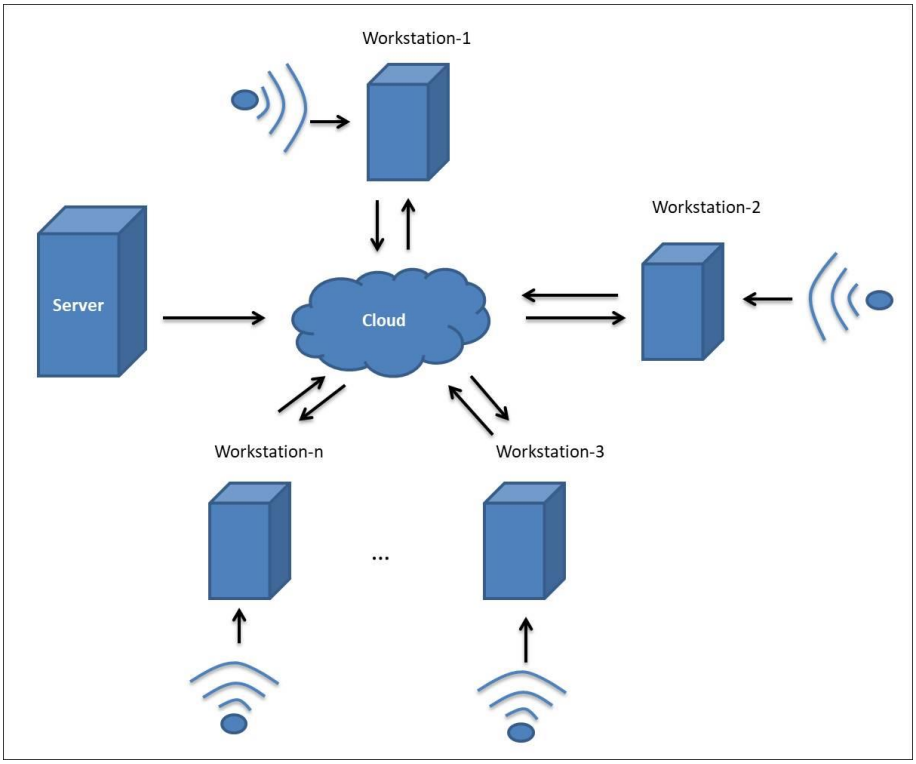

Figure 1. *The architecture of the social distancing automation*

In Figure 1, the interaction between the server and workstations is provided by the cloud. n number of workstations located in different areas will be able to receive data from sensors located in those areas and transfer them to the cloud.

3. Implementation

Rangefinders, which will be placed in different areas in the factory, can instantly send distance violations in that area to the nearest workstation. The model of the workplace is shown in Figure 2. The rangefinders placed in the areas marked with arrows in Figure 2 are designed to measure the distance of personnel entering that area. Measurements are sent to the cloud by the workstation. The identification number given to the personnel by the enterprise is defined at the workstations. It is envisaged to record the entry and exit of personnel in all areas at workstations. For example, in a factory whose model is shown in Figure 2, it is prevented that anyone other than authorized personnel is out of their area. The workstation sends this id number personnel information to the cloud when it enters any area determined by the arrow with the personnel card. After this notification, social distancing automation includes staff entry into that area and distance measurements by the workstation. Figure 3b indicates the real distance in detail when the data was received from the desktop software.

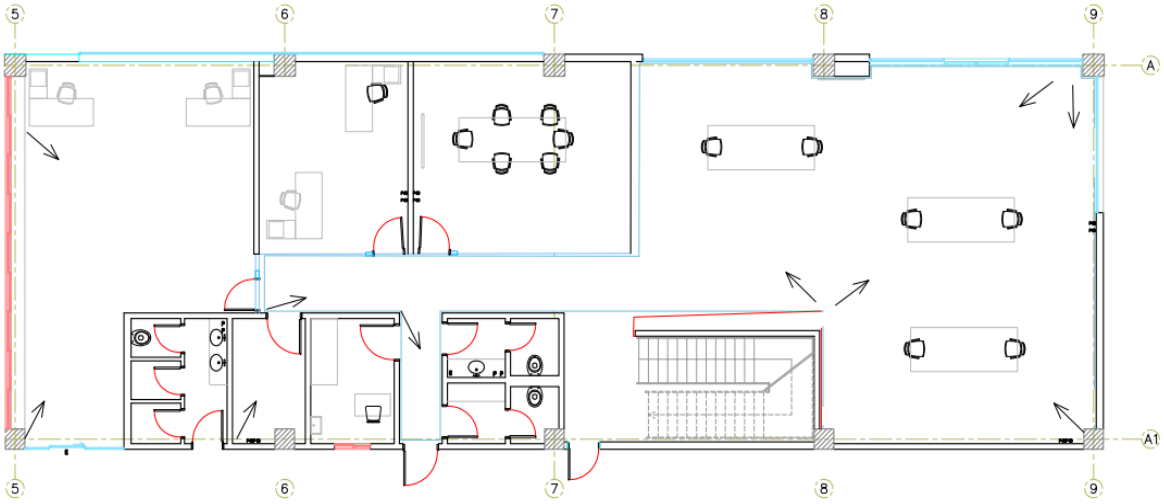

Figure 2. *The modeling of the workplace for the social distancing automation*

The workstation user interface is shown in Figure 3a. Authorized personnel can control the personnel information of their own unit with the workstation software.

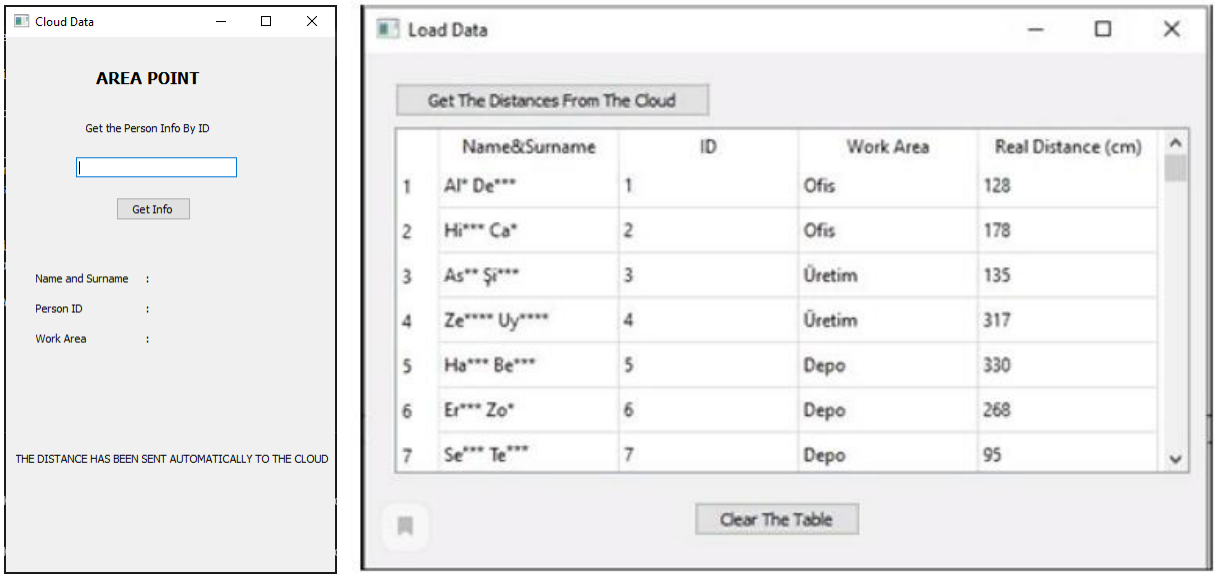

Figure 3. ***a)*** *Workstation user interface,* ***b)*** *Personnel information transmitted to the server*

Figure 4 shows the violation report. Violation report indicates who entered the areas that should not be entered, how often, and at what distance. Whether the personnel stays within the defined distance can be observed in the violation report.

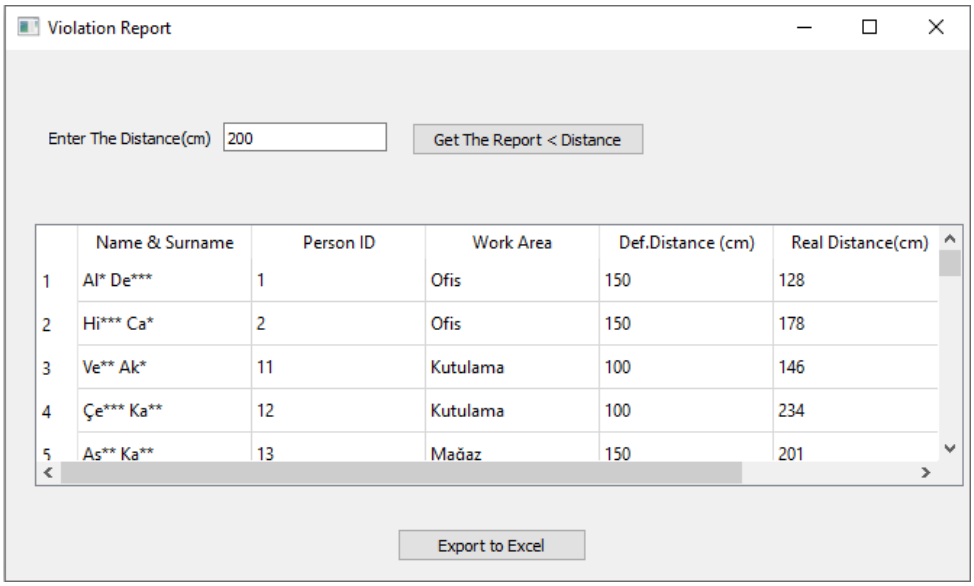

Figure 4. *Violation report*

4. Conclusion

This study aims to control the people working together to work in a healthy environment during the pandemic. In this study, social distancing automation that includes desktop software, workstation software, and an integrated circuit has been developed. Cloud-based social distancing automation software has the infrastructure to be applied to a workplace. The validation of this study continues to be tested with sample data. This application has the potential to work integrated with the personnel attendance tracking system and access control systems. It is also possible to develop an application that will make the machines stop when the personnel enters the area where they should not be. In this proposed study, it is foreseen that the risk of transmission of diseases such as Covid-19 will be kept at a minimum level by maintaining the social distance of the personnel. It is thought that the enterprise, whose social distance is maintained, will also contribute to public health. It is aimed to create awareness of protecting their own safety by being more careful in the office where the personnel will enter knowing that the distance is measured. If the enterprise analyzes the areas that are violated, it may have the opportunity to reduce the hazard levels or relocate the areas where the personnel are frequently and constantly. If the system works stably and the reporting is followed regularly, the personnel and work areas reach the level of being more visible and more manageable.

Declaration of Interest

There is no conflict of interest.

References

[1] T.C. Aile Çalışma ve Sosyal Hizmetler Bakanlığı, “Yeni Koronavirüs Salgini Kapsaminda İş Sağlığı ve Güvenliği Profesyonellerinin İşyerlerinde Aldıracağı Tedbirler,” [Online]. Available: https://ailevecalisma.gov.tr/media/42183/yeni-koronavirus-salgini-kapsaminda-is-sagligi-ve-guvenligi-profesyonellerinin-isyerlerinde-aldiracagi-tedbirler.pdf [Accessed July 16, 2021].

[2] A. Gad, G. ElBary, M. Alkhedher, and M. Ghazal, “Vision-based approach for automated social distance violators detection,” 2020 International Conference on Innovation and Intelligence for Informatics, Computing and Technologies (3ICT), ‘2020, pp. 1-5, doi: 10.1109/3ICT51146.2020.9311969.

[3] S. Siddiqui, M. Z. Shakir, A. A. Khan, and I. Day, “Internet of things (IoT) enabled architecture for social distancing during pandemic”, Frontiers in Communications and Networks, vol. 2, 2021. https://doi.org/10.3389/frcmn.2021.614166

[4] X. V. Wang, and L. Wang, “A literature survey of the robotic technologies during the COVID-19 pandemic”, Journal of Manufacturing Systems, 2021. https://doi.org/10.1016/j.jmsy.2021.02.005

[5] Ainstein, “5 IoT implementations for social distancing management,” [Online]. Available: https://ainstein.ai/ebook-5-iot-implementations-for-social-distancing-management/ [Accessed July 16, 2021].