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Smart Performance of Virtual Simulation Experiments Through Arduino Tinkercad Circuits

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Research Article

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Abstract: Due to the quick advancement of technology, instructors, teachers, and students may now access a variety of tools and apps. where the output may be easily analyzed, processed, shared, stored, and displayed. The need for open source software and hardware products is increasing due to several video tutorials and movies on operational concepts and educational concepts. To lessen the likelihood of mistakes or problems, one might make sure to deal with the simulation environment before making the actual connection. This article focuses on the Tinkercad environment, which allows users to apply various plans for creating various configurations on electrical components like as sensors, breadboards, resistors, and other active and passive components with control boards like Arduino and Raspberry Pi.

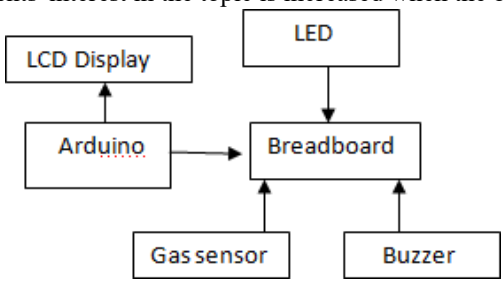
Keywords: Tinkercad Arduino, a teaching tool, and virtual simulation

INTRODUCTION

C programming is increasingly being used in digital design as part of the technology education system. The main difficulty with utilizing such free tools is that they may assist students in connecting real hardware, such as switches, cables, and LED lights, and creating their own plans using various equipment without requiring any equipment setup. Tinkercad is a simulator program that will assist users at many levels, including undergraduate, college, and school pupils. Because it is easy to construct basic programming languages. Even with enormous circuit sizes, students may quickly and simply rebuild and reprogram in simulation. Therefore, in the COVID-19 scenario, this kind of digital tool may enable students study from home while simultaneously bridging the gap in the present educational system. Coding with Tinkercad is incredibly simple and fun [1]. Additionally, it is the greatest web-based simulation that is open source [2].

Tinkercad provides the greatest platform for learning various sensor concepts and applications using virtual Arduino and Raspberry Pi devices. This environment allows for the storage of several models on the cloud, where it is simple for academic staff or instructors to identify any type of flaw. The Tinkercad learning tool makes project-based learning feasible [3]. Prototype circuits may be performed using a variety of sensors [4].

Students' interest in the topic is increased when the basic



model is taught using the most recent cutting-edge technological notion. Tinkercad is an open-source program that facilitates collaborative project work [5]CIRCUIT DESIGN

Many health issues occur due to leakage of gas. For this immediate action is required. In daily life good environment and healthy condition is very essential for our health. Presence of these dangerous gases can be detected by the gas sensor, so gas sensor is very helpful for detection. The complete circuit makes an alarm alert system for the awareness of dangerous gas. Here we are using Arduino board with LCD display, buzzer and the Gas sensor. The basic block diagram for gas detection circuit is shown in Fig. (1) Many gas detector circuits can be easily monitored by using Arduino UNO which is the center of control on this Tinkercad tool [6]. Gas leak detection can be alerted through Arduino and sensor circuit connection with LCD [7] and [10]. Arduino is also used for many applications like floor cleaning [8] and in waste alarm system [9]. Simulation based performance will give early information about the easy performance for any application [11].

I. APPLICATIONS

Different types of applications are possible to design on Tinkercad tool, but here we are focusing on three small applications:

A. Gas sensing alarm system

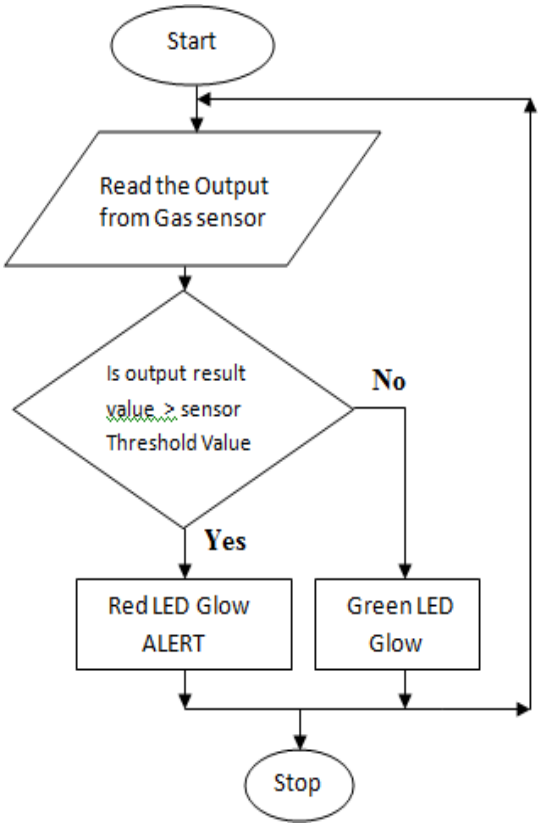


Fig 2. Flow chart for gas alarm system.

Once the detector detects the gas, immediately with the help of Arduino the program simulation results are obtained on the LCD display. Buzzer sound will be generated when gas concentration will increase as per the set value in the program. As per the required instructions, signal information will trigger the buzzer. Fig. (2) represents the flow diagram of gas sensing alarm system. Fig. (3) and (4) represents gas sensing circuit in Tinkercad environment.

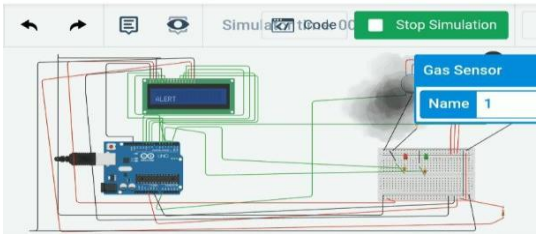


Fig 3. Simulation circuit for gas sensing alarm system

Fig 4. Gas alarm system for Tinkercad environment

B. LED Brightness control

Also, in this context we are also performing two other applications in Tinkercad environment,

i. LED brightness control through potentiometer

ii. seven segment display.

Easily one can construct and perform on this environment. The potentiometer has three pins, the center pin of the potentiometer is always voltage In and pins in the left and right are used as voltage output. The complete circuit connection is shown in Fig. 5. Different applications can be performed by using Arduino in industrial applications [8]. Fig. (5) represents the application of brightness control through potentiometer.

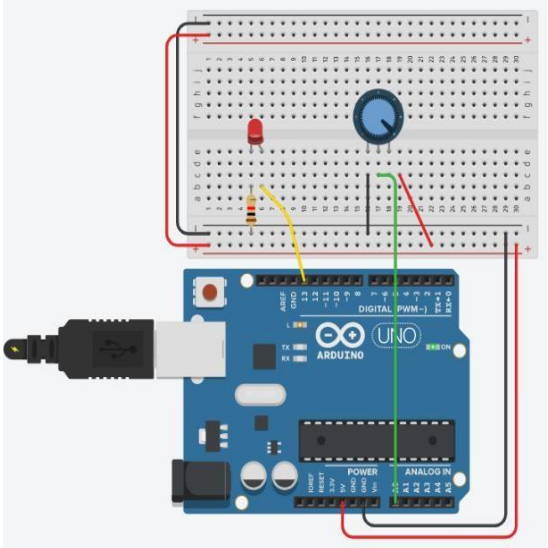
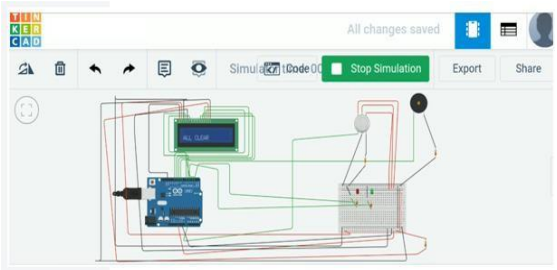


Fig 5. LED brightness control circuit using potentiometer

C. Seven Segment Display

Also in this context we are also performing two other applications in Tinkercad environment,



i. LED brightness control through potentiometer in Fig. (5)

ii. Seven segment display in Fig. (6) and Fig. (7).

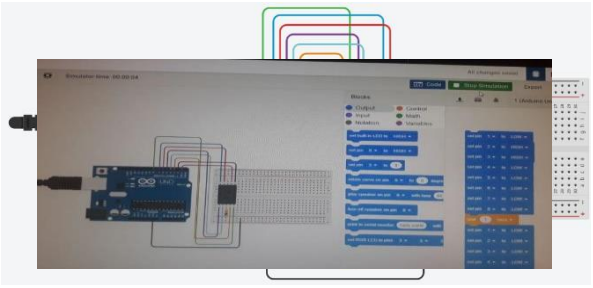


Fig 6. Seven segment circuit in Arduino model

Fig 7. Performance of seven segment in Tinkercad environment.

II. DIGITAL TOOL

The fundamental idea behind all of these various programs is that anybody may complete the practical right away. It's a clever technique that saves time for both the user and the teacher. It takes less time for students or personnel to finish the hardware design after successful deployment. By using all of these digital tools, safety may be enhanced and waste time can be decreased. A new execution strategy on each circuit might boost output.

At the beginning of the Tinkercad environment, it is crucial to understand how to utilize some of the arithmetic, variables and notations, control components, input, and output. Additionally, several applications have been carried out by other researchers. The Tinkercad platform is ideal for usage in many applications when all passive and active components are integrated into a single system.

The educational institution may provide highly clever and seamless service for the online method of practical applications. It is a fairly free-flowing program with many study tutorials that may make the design process simple, engaging, and easy for users to comprehend. Additionally, it raises interest while saving money, time, and effort. It is the greatest learning platform where users can effortlessly and seamlessly build their talents. Students benefit from the Tinkercad tool, which inspires them to compete and teaches them new ways of thinking. Thus, this has a positive effect on learning and experimentation with laboratory activities, making it more advantageous for the whole educational system.

III. CONCLUSION

This kind of digital learning tool encourages the teacher, who may include the students in a variety of design tasks, and increases the students' attention to practical. In other words, complete learning may speed up certain experimental tasks. It is also incredibly easy to handle, affordable, and user-friendly. This digital tool may be highly beneficial for both technology-based and application-based science and math preparation. Tinkercad allows users to create various application-focused projects. diverse applications may improve students' understanding of programming and the computer process, and they will provide diverse outcomes. In order to improve their careers and advance their technological skills, educational institutions are encouraging students to collaborate with various digital platforms.

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