International Journal of Education, Information Technology and Others (IJEIT), August 2026, 9 (3), 222-227
DOI: https://jurnal.peneliti.net/index.php/IJEIT/article/view/15191
p-ISSN: 2654-2528 e-ISSN: 2623-2324
Accredited by Directorate General of Strengthening for Research and Development
Available online at https://jurnal.peneliti.net/index.php/IJEIT

Design and Development of a Smart Mini Piano Based on Arduino Nano

Diyajeng Luluk Karlina

Department of Electrical Engineering Vocational Education, Faculty of Teacher and Education, University Sultan Ageng Tirtayasa, Serang, Indonesia

Received: 5 Juni 2026
Revised: 10 Juni 2026
Accepted: 13 Juni 2026

Abstract

Smart Mini Piano is an educational musical instrument designed using an Arduino Nano microcontroller and eight push buttons as note inputs. The purpose of developing this device is to integrate microcontroller technology into music learning in a simple and interactive way. The device operates by reading inputs from the push buttons, each of which represents a musical note ranging from Do to high Do, and produces sound through a buzzer as the output. The methods used in this research include a literature review, circuit design, Arduino IDE programming, and device testing. The implementation results show that the entire system operates properly and can be used as an effective learning medium, particularly for children, to introduce the fundamentals of music and electronics. Furthermore, the device is portable, easy to use, and has the potential for further development.

Keywords: Arduino Nano, Smart Piano, Educational Media

(*) Corresponding Author: diyajeng@untirta.ac.id

How to Cite: Luluk Karlina, D. (2026). Design and Development of a Smart Mini Piano Based on Arduino Nano. *International Journal of Education, Information Technology, and Others*, *9*(3), 222-227. Retrieved from https://jurnal.peneliti.net/index.php/IJEIT/article/view/15191

INTRODUCTION

Music is one of the most universal forms of artistic expression and has been an integral part of human life since ancient times. Musical instruments, such as the piano, have played an important role in the world of music. With advances in technology, opportunities have emerged to integrate modern technology into traditional musical instruments, creating more interactive and innovative experiences. The development of technology in the modern era has encouraged innovation in various fields, including education and entertainment. One form of this innovation is the integration of musical arts and digital technology through smart devices.

The Arduino Nano-Based Smart Mini Piano is an example of the application of microcontroller technology that can create a simple yet educational musical instrument. With its compact design and relatively low cost, the Arduino Nano-Based Smart Mini Piano can be used as an interactive learning medium, particularly for children who want to learn the fundamentals of music. This innovation not only increases interest in musical arts but also introduces users to the basic concepts of programming and electronics (Gheorghe & Stoica, 2021).

The Arduino Nano-Based Smart Mini Piano is a simple electronic musical instrument designed using an Arduino Nano microcontroller as its main control unit. This device can be used to play piano notes through input sensors in the form

of push buttons, which are then processed by the Arduino Nano to produce sound output through a buzzer or speaker. The Arduino Nano is a microcontroller development board based on the ATmega328P chip, featuring a compact size. Unlike some other Arduino boards, the Arduino Nano does not have a DC power jack and uses a Mini-B USB connector. This board has 14 digital input/output pins and 8 analog input pins with a 10-bit resolution 1024 bit. Programming the Arduino Nano is performed using the Arduino Software (IDE) by simply connecting the board to a PC or laptop via a USB cable. The Arduino Nano cannot operate independently; it requires additional components to create useful and functional applications (Al-mimi et al., 2020).

Therefore, this research aims to design and develop an Arduino Nano-Based Smart Mini Piano that can function as both an educational tool and an entertainment device, featuring a simple design that is easy to replicate.

RESEARCH METHOD

The research process consists of three stages: Literature Review, Device Design Simulation, and Device Testing. The literature review method was selected to understand and analyze various perspectives, theories, and findings presented in the literature related to the research topic. The literature sources were collected from academic databases such as Google Scholar, DOAJ, and ProQuest. The selection criteria for the literature include its relevance to the research topic, publication year, source reliability, and research quality. The quality and reliability of the literature were assessed based on the review method, relevance to the research topic, research methodology, and the credibility of the authors or publishers.

Information obtained from the sources was analyzed and synthesized using descriptive and thematic analysis approaches. The main findings were identified and analyzed to provide a comprehensive understanding of the research topic. Through this literature review method, the research successfully identified and analyzed various theories, perspectives, and findings related to the study. This approach also provided a strong foundation for understanding the research topic and establishing the basis for further research.

The second stage involved designing the device using an Arduino Nano, push buttons, jumper wires, and a project board. The initial design was developed and simulated using the Wokwi simulator. After the simulation was successfully completed, the design was implemented in a physical prototype. The final stage was device testing. If the device operates successfully, the Smart Mini Piano will be able to produce musical notes ranging from low Do to high Do.

RESULTS AND DISCUSSION

Arduino IDE is software used to develop microcontroller applications. Its functions include writing programs, compiling code, and uploading programs to microcontrollers. Arduino IDE is equipped with a serial monitor that facilitates communication between microcontrollers and computers. Although it is open-source software and supports various operating systems, including Windows, macOS, and Linux, this application does not yet support debugging through simulation or hardware. Arduino IDE is also equipped with numerous C/C++ libraries that simplify the programming process and support the development of

various microcontroller-based applications. The following are the implementation steps for the Arduino Nano-Based Smart Mini Piano using Arduino IDE software (Hutauruk et al., 2019).

1. Required Components

The first step is to prepare the required components. The following are the components used in the Arduino Nano-Based Smart Mini Piano consist of an Arduino Nano, push buttons, jumper wires, a USB cable, and a breadboard.

2. Creating the Circuit Connections

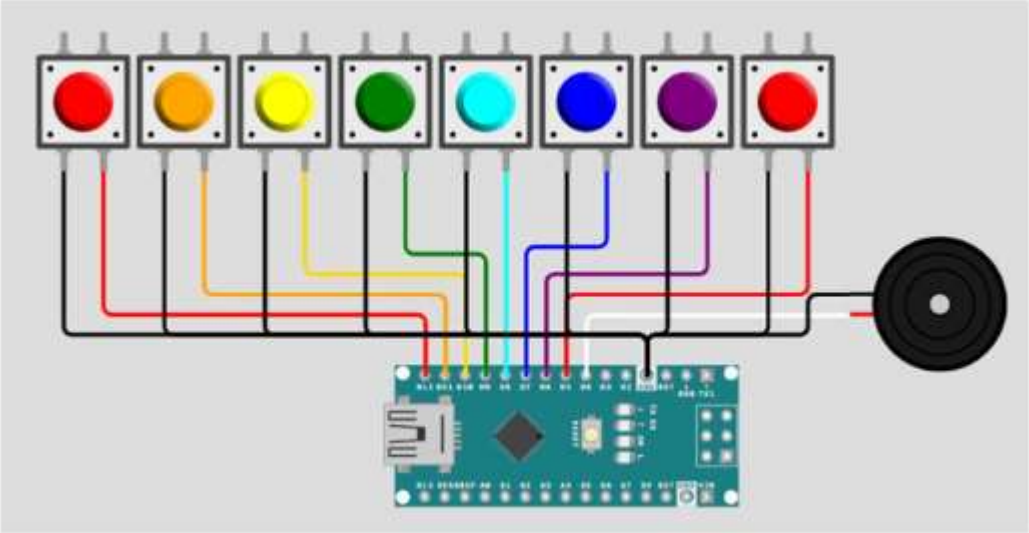


Figure 1. Circuit Connection Diagram

Figure 1 shows the circuit connections of the Arduino Nano-based Smart Mini Piano.

a. Arduino Nano pin D12 is connected to the red push button, which represents the Do note.
b. Arduino Nano pin D11 is connected to the orange push button, which represents the Re note.
c. Arduino Nano pin D10 is connected to the yellow push button, which represents the Mi note.
d. Arduino Nano pin D9 is connected to the green push button, which represents the Fa note.
e. Arduino Nano pin D8 is connected to the light blue push button, which represents the Sol note.
f. Arduino Nano pin D7 is connected to the blue push button, which represents the La note.
g. Arduino Nano pin D6 is connected to the purple push button, which represents the Si note.
h. Arduino Nano pin D5 is connected to the second red push button, which represents the high Do note.
i. The black or negative (–) wires of the buzzer and push buttons are connected to the GND pin of the Arduino Nano.
j. The red or positive (+) wire of the buzzer is connected to Arduino Nano pin D4.

3. Writing the Arduino Nano Program

After completing the component design and installation, the next step is to enter the program code into the Arduino IDE.

```
#include "pitches.h"

#define SPEAKER_PIN 8

const uint8_t buttonPins[] = { 12, 11, 10, 9, 7, 6, 5, 4 };
const int buttonTones[] = {
  NOTE_C4, NOTE_D4, NOTE_E4, NOTE_F4,
  NOTE_G4, NOTE_A4, NOTE_B4, NOTE_C5
};
const int numTones = sizeof(buttonPins) / sizeof(buttonPins[0]);

void setup() {
  for (uint8_t i = 0; i < numTones; i++) {
    pinMode(buttonPins[i], INPUT_PULLUP);
  }
  pinMode(SPEAKER_PIN, OUTPUT);
}

void loop() {
  int pitch = 0;
  for (uint8_t i = 0; i < numTones; i++) {
    if (digitalRead(buttonPins[i]) == LOW) {
      pitch = buttonTones[i];
    }
  }
  if (pitch) {
    tone(SPEAKER_PIN, pitch);
  } else {
    noTone(SPEAKER_PIN);
  }
}
```

Figure 2. Arduino Program Code

4. Device Testing

The next stage is the testing phase, which is conducted to ensure that the device functions properly. The testing begins by connecting the Arduino Nano to a computer using a USB cable and opening the Arduino IDE software. The program that has been developed is then uploaded to the microcontroller. Next, each push button connected to digital pins D12 through D5 is pressed individually to verify that each button produces the corresponding musical note, ranging from Do to high Do.

The buzzer connected to the D4 and GND pins of the Arduino Nano functions as the sound output. When each button is pressed, the buzzer successfully produces sound at the corresponding frequency based on the programmed musical notes. The test results indicate that the entire circuit and program function as expected. This demonstrates that the integration of hardware and software has been successfully

implemented, and the Smart Mini Piano is ready to be used as an educational and entertainment tool.

CONCLUSION

Based on the literature review and implementation of the Arduino Nano-Based Smart Mini Piano, it can be concluded that the device has been successfully developed and implemented. The device is capable of producing eight basic musical notes (Do to high Do) through push buttons connected to the Arduino Nano microcontroller, with sound output generated by a buzzer. The integration of hardware and software functions optimally, making the Arduino Nano-Based Smart Mini Piano a suitable interactive learning tool for introducing basic musical concepts and fundamental microcontroller programming to beginners, particularly children. Furthermore, the device features a simple and portable design that is easy to replicate.

REFERENCE

Al-mimi, H., Al-dahoud, A., Fezari, M., & Daoud, M. S. (2020). *A Study on New Arduino NANO Board for WSN and IoT Applications*. *29*(4), 10223–10230.

Chowdhury, I., & Ahmed, T. (2021). *Design and Prototyping of Sensor-based Anti-Theft Security System using Microcontroller*. *10*(03), 58–66.

Gheorghe, A. C., & Stoica, C. I. (2021). *WIRELESS WEATHER STATION USING ARDUINO MEGA AND ARDUINO NANO*. 35–38. https://doi.org/10.2478/sbeef-2021-0008

Hutauruk, A. R., Pardede, J., Aritonang, P., Saragih, R. F., & Sagala, A. (2019). *Implementation of Wireless Sensor Network as Fire Detector using Arduino Nano*. *Arduino ID*, 19–22.

Ilten, E. (2024). *4th International Conference on Innovative Academic Studies Toxic Gas-Meter Application for Android Device with Arduino Nano 33 IoT Arduino Nano 33 IoT ile Android Cihaz için Zehirli Gaz - Metre Uygulaması*. *March*, 125–130.

Iqbal, M., Zakki, M., Najib, M., Hussain, M., & Seroji, N. (n.d.). *Implementation of Particle Swarm Optimization for tuning of PID controller in Arduino Nano for Solar MPPT system*.

Kuria, K. P., & Robinson, O. O. (2020). *Monitoring Temperature and Humidity using Arduino Nano and Module-DHT11 Sensor with Real Time DS3231 Data Logger and LCD Display*. *9*(12), 416–422.

Muqbali, A. Q. A. L., & Radi, A. M. R. (2025). *OPERATING AND IMPLEMENTING A MUON DETECTOR USING ARDUINO NANO*. *32*, 2041–2047.

N, K. K., Vigneswari, D., & Rogith, C. (2019). An Effective Moisture Control based Modern Irrigation System (MIS) with Arduino Nano. *2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS)*, 70–72.

Nuratch, S. (2017). A universal microcontroller circuit and firmware design and implementation for iot-based real-Time measurement and control applications. *2017 International Electrical Engineering Congress, IEECON 2017*. https://doi.org/10.1109/IEECON.2017.8075906

Rochman, S., & Yunianto, B. I. (2019). *PROTOTYPE AUTOMATIC LIGHTS CONTROL SYSTEM IN*. *01*(1), 2714–2715.

Series, C. (2019). *Teaching Microcontrollers using Arduino Nano Based Quadcopter Teaching Microcontrollers using Arduino Nano Based Quadcopter*. https://doi.org/10.1088/1742-6596/1413/1/012003

Siregar, I. M., & Yunus, M. (2022). *Prototype of Garbage Picker Ship Robot Using Arduino Nano Microcontroller*. *02*. https://doi.org/10.31763/iota.v2i3.540

Tawffaq, M. R., Al-aswad, F. M. S., & Khalil, I. M. (n.d.). *The Operational States and Energy Utilization of the Arduino Nano and Arduino Micro in 5G Networks*. 639–648.