Minecraft Jukebox

ESP32 + SD Card Playback

From Disc Color to Music – No Cloud Needed

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Presented to Mr Taha and Mr Misbah

Design Philosophy

T**he Problem:**

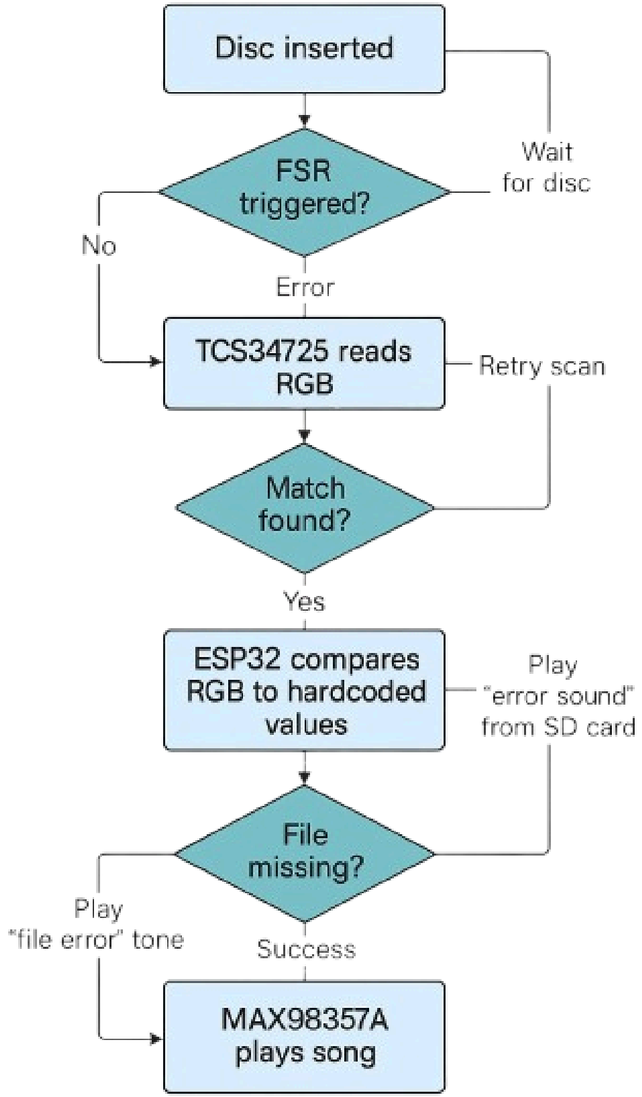
- Nostalgia: Minecraft’s jukebox was nostalgic → Wanted a real-world version.

The Goals:

1. **Accuracy:**
    - Looks/feels like Minecraft’s jukebox (blocky, pixel art, discs).
2. **Offline:**
    - Works without internet (SD card = "enchanted music vault").
    - User inserts disc → music plays like magic (no visible tech).
3. **Immersion:**
    - Hidden tech (sensors inside, no buttons/wires exposed).
    - No visible disk detection methods (e.g., QR codes, RFID tags).

How It Works

While the flowchart shows the basic steps, here’s what makes it special:
The jukebox uses hidden analog magic – the FSR measures pressure changes as fine as 5 grams to detect discs, while the color sensor works even in dim lighting thanks to ESP32’s auto-gain calibration. Songs are stored as 16-bit 22kHz WAV files on the SD card for crisp Minecraft-style audio, and the entire system draws less power than a nightlight when idle.



Testing the Disc Detection

- Test: Measure FSR resistance thresholds (e.g., >500Ω = disc inserted).
- Issue: False triggers → Added debounce delay in code and adjusted threshold accordingly.

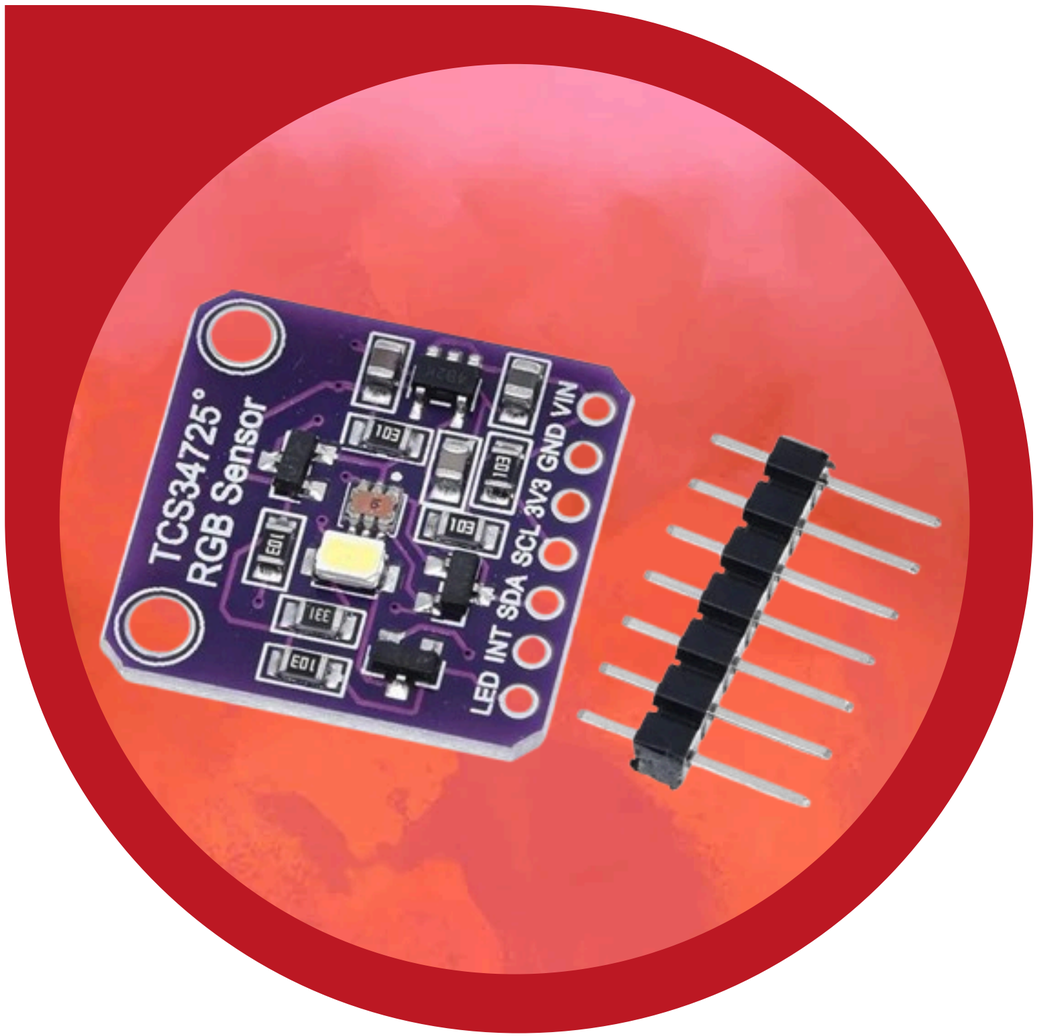
Testing the Disc Detection

Challenge:

- The sensor arrived unsoldered – we hand-attached headers and discovered ambient light skewed readings.

Solution:

- **Dark Room Calibration:**
- Tested 5 colored discs in darkness to isolate true RGB values
- Compared sensor’s HEX outputs to known disc colors (e.g., #FF0000 for red)
- **Soldering Fix:**
- Reflowed loose joints that caused intermittent disconnects



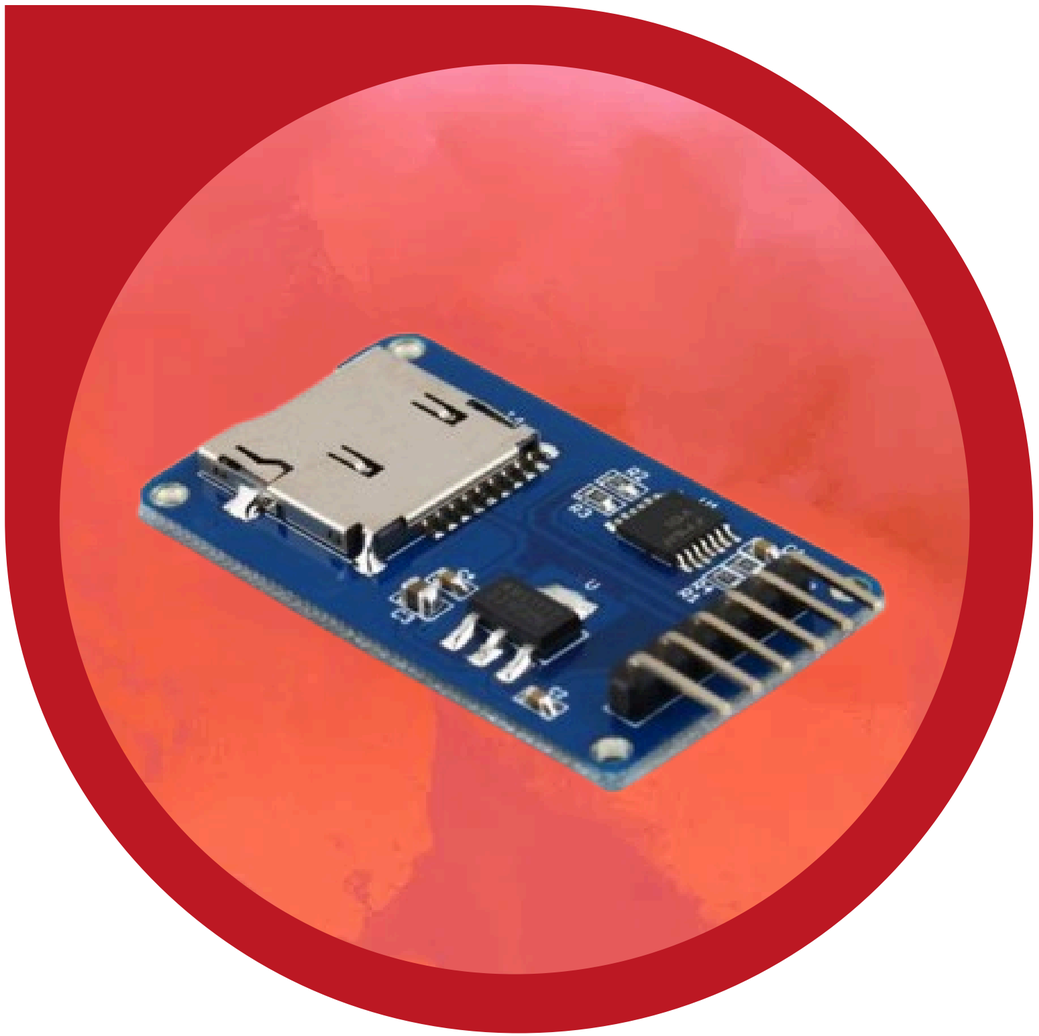
SD Card: The Music Vault

Issue:

- WAV files failed to play – discovered stereo files and incorrect bitrates.
- Intermittent loading due to loose SPI connections.

Debug Process:

1. **File Analysis:**
   - Printed file headers (RIFF format) – found 44.1kHz stereo files.
   - Converted to 16-bit mono 22kHz WAV using Audacity.
2. **Hardware Fix:**
   - Rewired SPI pins (SCK/MISO/MOSI) with shorter cables.



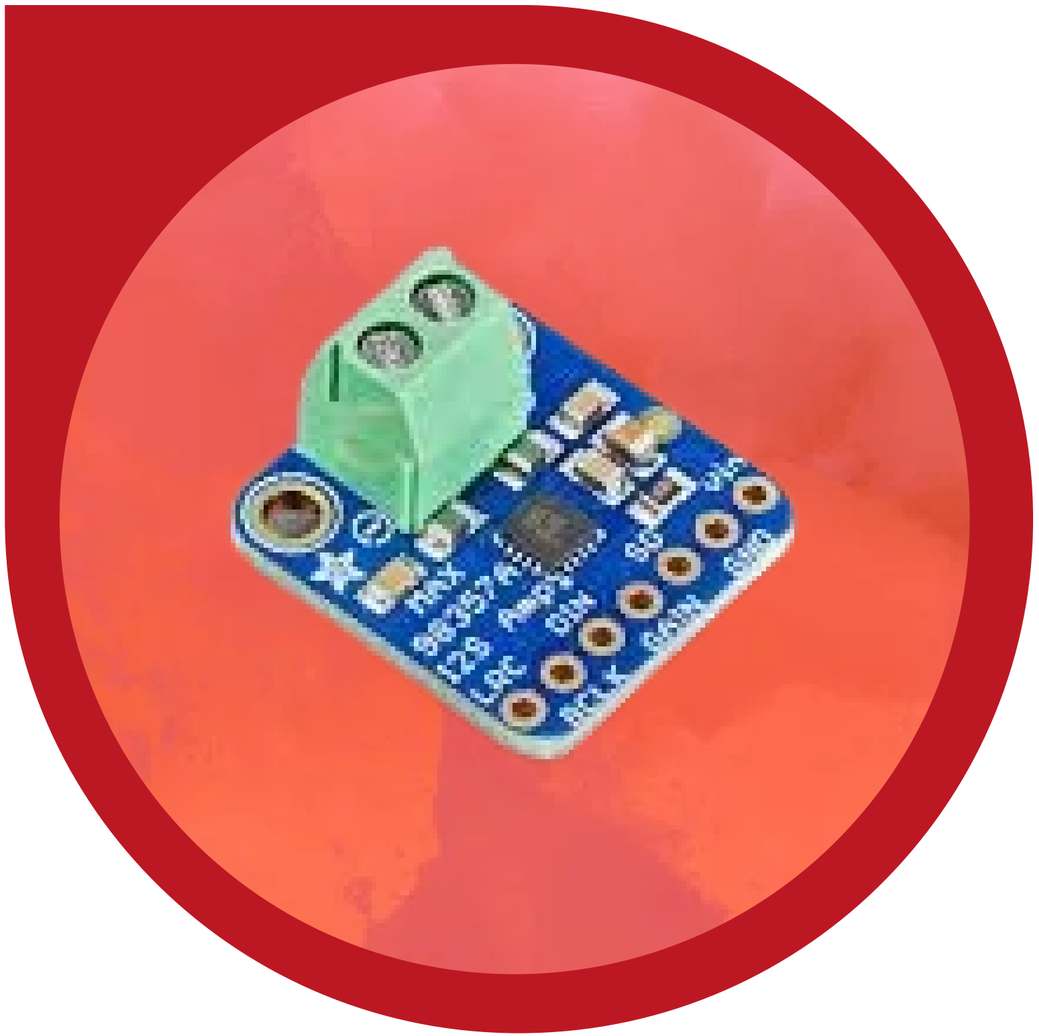
MAX98357A Speaker

Problems:

1. **Soldering Issues:**
   - Cold joints caused audio distortion.
2. **Library Incompatibility:**
   - Multiple libraries (ESP8266Audio, Adafruit_VS1053) failed with I2S errors.
   - Audio glitches (pops/crackles) due to incorrect buffer settings.

Solutions:

1. **Hardware Fixes:**
   - Re-soldered pins with flux + reinforced connections.
2. **Software Fixes:**
   - Switched to mono stable audio



Future Upgrades

01 🔊 Volume knob
(analog potentiometer)

02 📟 OLED display
(show song titles)

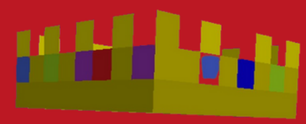
03 Voice control
("Play Cat" for green disc)

Journey Recap:

✅ Authentic Minecraft Experience
- Used color-matched discs (no modern workarounds)
- Hidden tech preserves the "magic" illusion

✅ Offline Functionality Perfected
- SD card system works without internet
- Instant disc-to-music response

✅ Future-Proof Foundation
- Modular code for easy upgrades
- Hardware ready for new features



Thank you very much!