Automatic Controlled Car Parking System

Transitioning the Base Material to Wood

1. Introduction

The **Automated Controlled Car Parking System** is a fully automated and enclosed parking solution using sensors, motors, and an LCD display. It detects vehicles, counts available parking spaces, and provides real-time updates on a display. It also features LED indicators for occupied parking spaces.

Currently, the frame of the system is made of Styrofoam (Thermocol). However, this material has significant limitations. It is fragile, prone to breakage, and lacks the sturdiness required for more robust applications.

To address these issues, we explored alternatives such as **metal, plastic, and wood**. After evaluating the options, we decided to transition to wood. Wood offers a balance of durability, strength, and practicality for this stage of development. Although metal is a more advanced material, it is beyond the current scope but remains a potential future upgrade.

2. Objective

While the primary goal is to switch the base material from Styrofoam to wood, this transition brings opportunities for improvements:

1. **Enhanced Finish**: Paint the project for a polished look instead of using wrapping paper.
2. **Better Assembly**: Use nails and metal fasteners for a sturdier connection between components.
3. **Increased Capacity**: Add an extra parking spot to the system.
4. **Expansion of Components**: Include more Arduinos, motors, sensors, LEDs, LCDs, and wires to upgrade the system's functionality.

3. Advantages of Using Wood Over Other Materials

- **Eco-Friendliness**: Wood is a renewable and biodegradable resource, making it environmentally sustainable.
- **Durability**: Wood offers superior strength and sturdiness, making the system more resistant to physical damage.
- **Aesthetic Appeal**: It has a natural, customizable finish that can enhance the project's overall appearance.

4. Challenges of Using Wood

- **Susceptibility to External Factors**: Wood can be damaged by moisture, pests, or wear over time.
- **Higher Costs**: Additional materials like nails, fasteners, and tools such as a woodcutter increase the cost.
- **Precision Requirements**: Cutting and shaping wood for component mounting demands more accuracy than Styrofoam.

5. Design Adjustments for Wood

Component Mounting

To integrate components, we plan to follow the same basic approach used with Styrofoam: cut openings and insert the components. However, with wood, this process requires greater precision to ensure proper fit and stability.

Connecting Wood Pieces

We will use one of the following methods to assemble the wooden frame:

1. **Fasteners**: Nails and screws will provide a sturdy and secure connection.
2. **Joints**: Carved interlocking joints will offer additional stability and an elegant design.

6. Comparison with Existing Materials

Feature	**Styrofoam**	**Wood**
Cost	Lower	Higher
Environmental Impact	Biodegradable	Biodegradable
Durability	Lower	Higher
Weight	Lighter	Heavier
Lifespan	Lower	Moderate

7. Implementation Plan

After planning every detail, we began creating the wooden Automated Controlled Car Parking System. Like the Styrofoam model, we constructed the **main base** and the **underground deck** for the Arduino. The underground section measured **10 cm in height**, while the main base was **14 cm tall**.

We started by **cutting and assembling the wooden pieces** for the frame. Using **nails and screws**, we ensured that the connections were sturdy and well-secured. For the integration of electronic components, precise **cutouts were made** to mount sensors, motors, and the LCD display securely.

Once the frame was complete, we moved on to **painting and finishing**. A protective coating was applied to make the wood resistant to **moisture** and **wear**. Afterward, the electronics were installed, including additional sensors, Arduinos, and wiring.

The system was **tested in multiple stages** to ensure functionality. Adjustments were made to enhance the reliability of the **gates, sensors, and LEDs**. Finally, an extra parking spot was added to the design, and the finished system was ready for **evaluation**.

8. Results and Observations

The wooden base proved to be **far more durable and stable** than the Styrofoam model. The system's overall **structural integrity** improved, making it less prone to breakage. The use of wood also enhanced the system's **aesthetic appeal**, especially after painting and finishing.

Performance testing showed **smooth operation** of all integrated components. The **LED indicators**, **gate mechanisms**, and **LCD display** functioned as intended. The additional parking spot was successfully incorporated, increasing the system's capacity. However, during testing, it was observed that **precise cutting and drilling** were crucial for maintaining alignment and stability.

The transition to wood increased the system's **longevity** and **resistance to external factors**, but the **weight** was noticeably higher, making portability less convenient. The moisture resistance provided by the protective coating performed well during testing, with no observed deterioration.

9. Conclusion

The transition from Styrofoam to wood has been a significant upgrade for the Automated Controlled Car Parking System. The new wooden frame offers **increased durability, stability, and lifespan**, addressing the limitations of the Styrofoam design. While the process required **greater precision** and **additional resources**, the outcome was well worth the effort.

The wooden model not only performs reliably but also stands out visually due to its polished finish. This transition marks a step forward in the project's evolution, paving the way for potential future upgrades, such as incorporating **metal** for even greater strength and durability.

By embracing wood, the system now reflects a more **professional and refined design**, aligning with the goals of innovation and practicality.