SNS COLLEGE OF ENGINEERING

Coimbatore-35
An Autonomous Institution
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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III MCT / V SEMESTER

UNIT 5–REAL TIME OPERATING SYSTEMS
TOPIC 4 –ATM MACHINE

SNS COLLEGE OF ENGINEERING

(Autonomous)

DEPARTMENT OF MECHANICAL ENGINEERING

EMBEDDED SYSTEM FOR MECHATRONICS

Guess Today's Topic????

Embedded System in ATM Machine

What is Embedded System

Embedded System in ATM Machine

An ATM is an embedded system which utilizes a crowded computer to set up a network between a bank computer and an ATM itself. It also has a microcontroller to bear both input and output operations

Code Optimization:

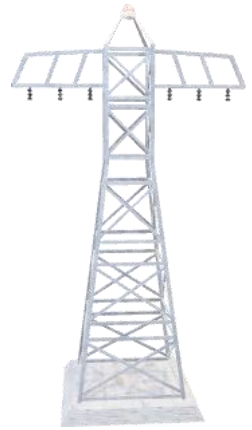
- Optimize code for speed and size using compiler optimizations, code reviews, and best coding practices.

Resource Management:

- Carefully manage resources like CPU cycles, memory, and peripherals to prevent contention and ensure predictable behavior.

Monitoring and diagnostics : Implement monitoring and diagnostic features to track system behavior and identify anomalies. This helps in troubleshooting and maintaining the system over time.

•**RTOS configuration:**Fine-tune RTOS parameters such as time-slicing, task preemption, and interrupt handling to match the real-time requirements of the ATM system.



•**Security and reliability :**Implement security measures to safeguard sensitive information and ensure the reliability of the ATM system against potential attacks or failures.

• **Power Management :I**mplement power-saving mechanisms to extend the lifespan of the ATM system and minimize energy consumption when idle or during low activity periods.

•**Interrupt handling:**Minimize interrupt latency by optimizing interrupt service routines (ISRs). Keep ISRs as short and efficient as possible to reduce the impact on real-time tasks.

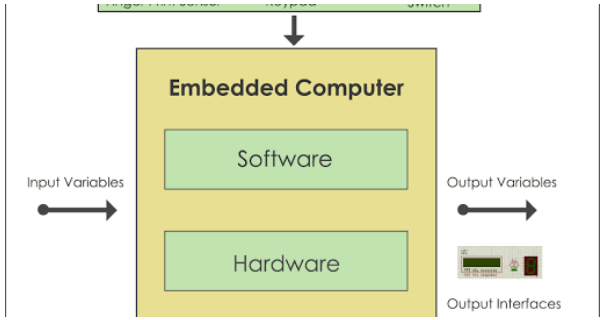
• **Hardware Abstraction:**Utilize hardware abstraction layers to isolate the application from hardware specifics. This allows easier porting to different hardware platforms if needed.

Testing and profiling

•Thoroughly test the RTOS and application under various scenarios to identify bottlenecks, potential deadlocks, and performance issues. Profiling tools can help pinpoint areas for optimization..

I/O Optimization:

- Optimize input/output operations, such as communication with the card reader, keypad, and display, to reduce latencies and ensure responsive user interactions.



Memeory Management

- Use memory efficiently by avoiding memory leaks and fragmentation. Employ techniques like memory pools and dynamic memory allocation with caution, as they can introduce overhead and potential fragmentation.

- **Error handling :**Develop robust error handling mechanisms to detect and recover from faults, ensuring system stability.
- **Debugging and profiling:**Utilize debugging tools and profilers to identify performance bottlenecks, memory leaks, and excessive CPU usage.

RTOS (Real-Time Operating System) Optimization:

•**Task Prioritization**:Assign appropriate priorities to different tasks within the ATM system. Critical tasks like transaction processing should have higher priorities to ensure timely execution.

• **RTOS**:well-suited for your ATM machine's requirements. Consider factors like task scheduling, interrupt handling, memory management, and support for real-time constraints.

Multiple Choice Question

1. What is the primary purpose of the embedded system in an ATM machine?
A) Display advertisements to customers
B) Control the temperature of the ATM room
C) Enable communication between the ATM and the bank's servers
D) Play background music for customers
2. Which component of an embedded system in an ATM is responsible for reading your bank card and identifying your account?
A) Printer
B) Keypad
C) Card Reader
D) Display Screen

3. What security measure is commonly implemented by embedded systems in ATMs to prevent unauthorized access to sensitive information?
A) Sending passwords through unencrypted channels
B) Storing PINs in plain text
C) Using biometric authentication
D) Displaying PINs on the screen

4. Which of the following best describes the role of an embedded system in an ATM's cash dispensing process?
A) Monitoring local weather conditions
B) Providing internet browsing capabilities
C) Controlling the dispensing of cash to customers
D) Playing video advertisements to users

5.What is the purpose of the PIN pad on an ATM, which is part of the embedded system?
A) To display account balance
B) To select different languages for the ATM interface
C) To enter a personal identification number (PIN)
D) To scan fingerprints for security verification

Answers:

1. c) Enable communication between the ATM and the bank's servers
2. C) Card Reader
3. C) Using biometric authentication
4. C) Controlling the dispensing of cash to customers
5. c) To enter a personal identification number

Puzzles

1. **Power Savings in Sensor Node:**
   You're designing an embedded system for a remote environmental monitoring station powered by a small solar panel. The system needs to collect data from multiple sensors and transmit it wirelessly to a central server. How can you optimize the power consumption to ensure the system operates efficiently and maximizes the time between battery recharges?

2. **Real-Time Control of Robot Arm:**
   You're developing software for controlling a robotic arm in a manufacturing assembly line. The arm needs to perform precise movements with minimal delay. How can you optimize the control algorithm and task scheduling to ensure that the arm's movements are both accurate and timely?

Puzzles

3. **Memory Management in Wearable Device:**
   You're working on an embedded system for a wearable fitness tracker. The device needs to store data such as steps taken, heart rate, and sleep patterns. However, memory space is limited. How can you optimize the data storage and memory management to ensure that the device can store as much data as possible while still functioning smoothly?

4. **Image Processing for Autonomous Vehicle:**
   Your embedded system is responsible for processing images from multiple cameras on an autonomous vehicle. The vehicle needs to detect obstacles, pedestrians, and road signs in real-time. How can you optimize the image processing algorithms and hardware acceleration to ensure the vehicle can make quick and accurate decisions while driving?

Puzzles

5. **Optimizing Wireless Communication Range:**
You're designing an embedded system for a remote weather station that transmits weather data to a central hub wirelessly. The station is located in a mountainous area with limited line-of-sight communication. How can you optimize the wireless communication protocol and antenna placement to maximize the communication range and reliability?

Thank you