ADDIS ABABA UNIVERSITY

ADDIS ABABA INSTITUTE OF TECHNOLOGY

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING

COMPUTER STREAM

INTRODUCTION TO EMBEDDED SYSTEMS ASSIGNMENT

NAME   ID

DAMISU SEFU………………………………………….UGR/5286/12

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Embedded System: Refrigerator

What it does and why it's an Embedded System:
A refrigerator is a household appliance designed to keep food and beverages cool, thereby preserving their freshness and extending their shelf life. It is considered an embedded system because it contains dedicated hardware and software components to control its various functions automatically. Embedded systems are ideal for refrigerators because they offer real-time control, efficient operation, and customization of features to meet user needs.

What it contains (Hardware and Software Components):

1,Hardware Components:
Compressor: Responsible for circulating refrigerant through the system to cool the refrigerator.
Condenser: Converts the refrigerant gas into liquid form by dissipating heat.
Evaporator: Absorbs heat from the refrigerator's interior, causing the refrigerant to evaporate.
Thermostat: Monitors the temperature inside the refrigerator and controls the compressor's operation accordingly.
Door Sensors: Detects the opening and closing of the refrigerator door to prevent temperature fluctuations.
Display Panel: Provides user interface for adjusting temperature settings and accessing additional features.
Control Board: Manages the operation of various components based on input from sensors and user commands.

2,Software Components:

i) Embedded Firmware:
Function: The embedded firmware acts as the core software that controls the overall operation of the refrigerator. It is responsible for managing various functions such as temperature regulation, defrost cycles, and energy management.
Temperature Regulation: The firmware monitors the temperature inside the refrigerator and adjusts it as per the user settings to maintain the desired level.
Defrost Cycles: It schedules and controls the defrost cycles to prevent ice buildup on the evaporator coils, ensuring optimal cooling efficiency.
Energy Management: The firmware optimizes the refrigerator's energy consumption by controlling the compressor cycles and other components based on usage patterns and environmental conditions.

ii) User Interface Software:

Function: This software component manages the interaction between the user and the refrigerator through the display panel and other input mechanisms.
Display Panel Control: It controls what information is displayed on the refrigerator's screen, such as current temperature settings, mode of operation, and alerts for any issues.
User Input Handling: The software interprets user inputs from buttons, touchscreens, or other input interfaces and translates them into commands for the firmware to execute.
Settings Management: Allows users to set preferences such as temperature levels for different compartments, activate special modes (e.g., vacation mode), and configure other features of the refrigerator.

Here's a simplified flowchart illustrating the operation of the refrigerator's software components:

1) **Start:** The refrigerator is powered on.
2) **Initialize:** The firmware initializes all components and sensors.
3) **Monitor Temperature:** Continuously monitors the temperature inside the refrigerator.
4) **User Input:** Waits for user input from the interface.
5) **Process Input:** Interprets the user's commands (e.g., changing temperature settings, activating a specific mode).
6) **Execute Commands:** The firmware executes the corresponding actions based on the user input.
7) **Repeat:** The system continues to monitor temperature and wait for user input until powered off.