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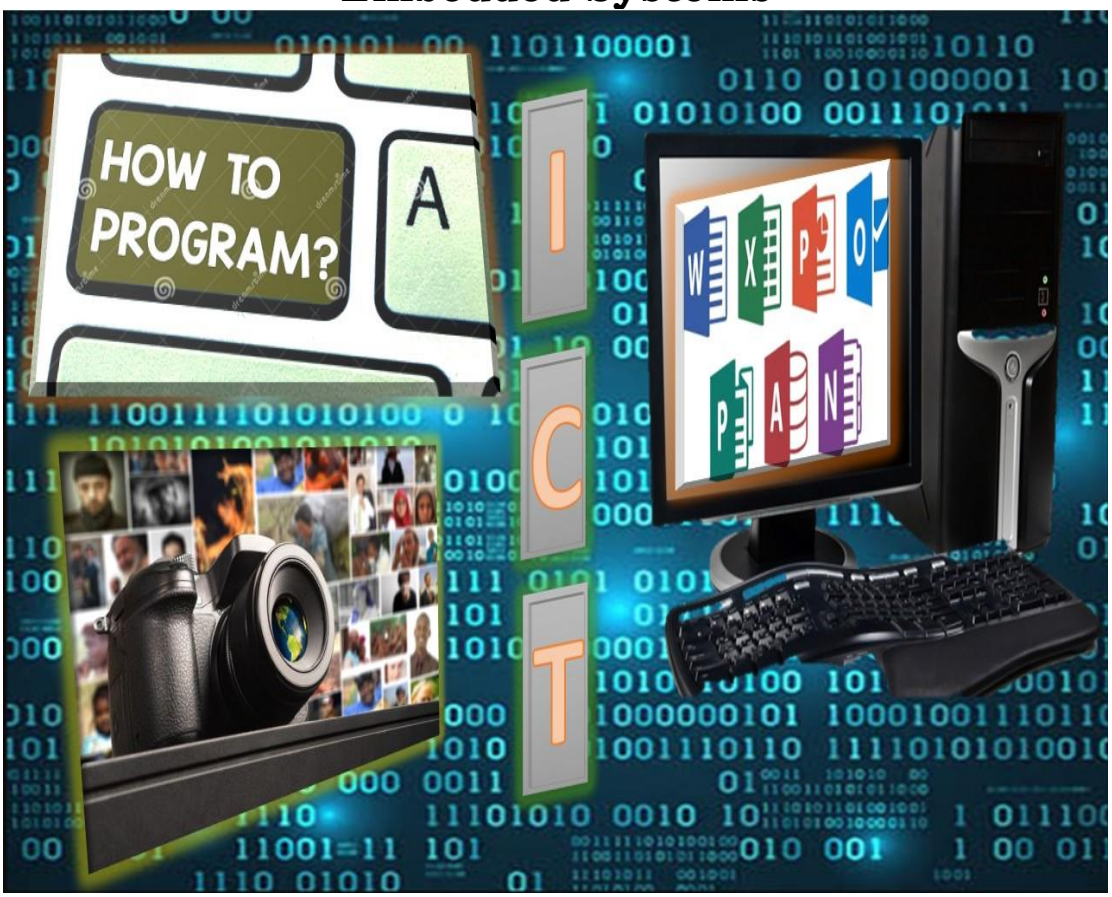
DepED
DEPARTMENT OF EDUCATION

ICT 9 Activity Sheet
Quarter 3 | Week 3

Embedded Systems



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WRITERS

Introductory Message

Welcome to ICT 9!

The **Learning Activity Sheet** is self-directed instructional materials aimed to guide the learners in accomplishing activities at their own pace and time using the contextualized resources in the community. This will also assist the learners in acquiring the lifelong learning skills, knowledge and attitudes for productivity and employment.

For learning facilitator:

The **ICT 9 Activity Sheet** will help you facilitate the leaching-learning activities specified in each Most Essential Learning Competency (MELC) with minimal or no face-to-face encounter between you and learner. This will be made available to the learners with the references/links to ease the independent learning.

For the learner:

The **ICT 9 Activity Sheet** is developed to help you continue learning even if you are not in school. This learning material provides you with meaningful and engaging activities for independent learning. Being an active learner, carefully read and understand the instructions then perform the activities and answer the assessments. This will be returned to your facilitator on the agreed schedule.

Name of Learner:_____ **Grade and Section:**_____
School:_____ **Date:** _____

ICT-9 ACTIVITY SHEET
Embedded Systems

Learning Competency:

Described embedded systems and their application in problem solving

Support Competencies:

1. Describe the structure of embedded system.
2. Explain the characteristics of embedded system.
3. Identify the applications of embedded system.

Background information for the learners

Embedded systems play a part in nearly every aspect of modern life. They impact the way we spend our leisure time, the way we commute, and the way we do business. Given that they are purpose-built for specific applications, they enable designs and optimizations that make it possible for us to enjoy the benefits of technology while minimizing cost and power consumption.

In this lesson, you will learn what is embedded system, its characteristics, structure, and applications.

Activity Proper
Activity 1.

What is Embedded System?

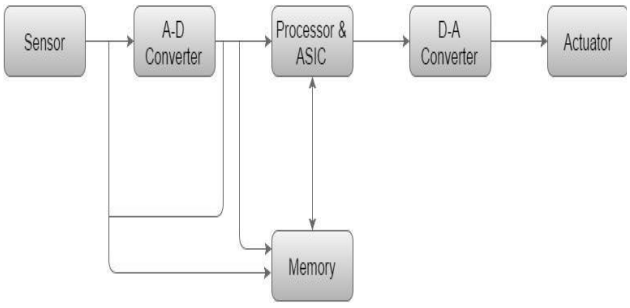
- The system in which dedicated purpose of software is embedded into a hardware design is known as embedded system.
- As a general guideline, computing devices (for example, device with a microprocessor or microcontroller) that are not general-purpose computers can be considered an embedded system. That means that a modern smartphone probably is not an embedded system, but it will likely have multiple embedded systems within it. For example, the electronics that control the camera and GPS system are embedded systems because they serve a specific purpose within the context of a larger system (the smartphone).
- The applications of embedded systems include Robotics, digital camera, multi-tasking toys, cooking and washing systems, key-board controllers, mobile & smart phones, computing systems, videos, games, music system and video games, and others.

Characteristics of an Embedded System

- **Single-functioned** – An embedded system usually performs a specialized operation and does the same repeatedly.
- **Tightly constrained** – It must be of a size to fit on a single chip, must perform fast enough to process data in real time and consume minimum power to extend battery life.
- **Reactive and Real time** – Many embedded systems must continually react to changes in the system's environment and must compute certain results in real time without any delay.
- **Microprocessors based** – It must be microprocessor or microcontroller based.
  A microprocessor or microcontroller are what give electronic systems processing power and fulfill the "computing device" requirement of embedded systems.
- **Memory** – It must have a memory, as its software usually embeds in ROM. It does not need any secondary memories in the computer.
- **Connected** – It must have connected peripherals to connect input and output devices.
- **Hardware-Software systems** – Software is used for more features and flexibility. Hardware is used for performance and security.

Basic Structure of an Embedded System

The following illustration shows the basic structure of an embedded system:



- **Sensor** − It measures the physical quantity and converts it to an electrical signal which can be read by an observer or by any electronic instrument like an Analog to Digital converter. A sensor stores the measured quantity to the memory.
- **A-D Converter** − An analog-to-digital converter converts the analog signal sent by the sensor into a digital signal.
- **Processor &** Application-Specific Integrated Circuit (**ASICs)**− Processors process the data to measure the output and store it to the memory.
- **D-A Converter** − A digital-to-analog converter converts the digital data fed by the processor to analog data
- **Actuator** − An actuator compares the output given by the D-A Converter to the actual (expected) output stored in it and stores the approved output.

Real Time Applications of Embedded Systems

1. Embedded System for Detecting Rash Driving on Highways

The main intention of this project is to design a highway speed-checker device that identifies rash driving on highways and alarms the traffic authorities if the speed checker finds any vehicle violating the set speed limits on highways.

2. Application of Embedded System for Street Light Control

The main intention of this project is to detect the movement of vehicles on highways and to switch on street lights ahead of it, and then to switch off the street lights as the vehicle go past the street lights to conserve energy.

3. Embedded System for Traffic Signal Control System

The main goal of this project is to design a densit based traffic signal system. At every junction, the signal timing changes automatically according to the traffic density at every junction. Traffic jam is a major problem in many cities across the world and gives regular nightmares to the commuters and travelers.

4. Application of Embedded System for Vehicle Tracking

The main purpose of this project is to find the exact location of a vehicle by using a GPS modem and in order to reduce vehicle thefts. The GSM modem sends an SMS to a predefined mobile which stores the data in it. An LCD display is used to display the location information in terms of latitude and longitude values.

5. Embedded System for Auto Intensity Control

This project is designed to auto intensity control of LED based street lights by using solar power from the photovoltaic panels. The awareness for solar energy is increasing, and many institutions and peoples are opting solar energy. In this project, Photovoltaic panels are used for charging batteries by converting the sun energy into electrical energy. A solar charge controller circuit is used to control the charging.

6. Application of Embedded System for Home Automation System

The main purpose of this project is to design a home automation system with the Android application based remote control. Remote operation is performed by Android OS based smart-phone or Tablet etc., upon a Graphical User Interface based touch screen operation. In order to achieve this, Android application act as a transmitter, that sends on/off commands to the receiver wherein loads are connected.

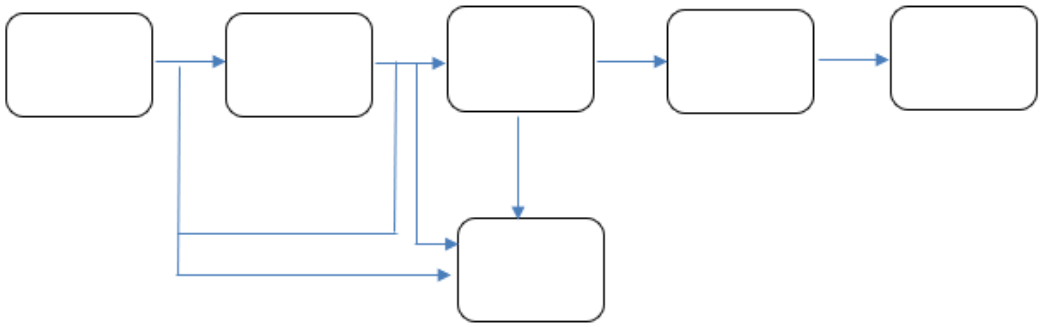
7. Embedded System for Industrial Temperature Control

The main intention of this industrial temperature controller project is to control the temperature of any device in any industrial application according to its necessity.

8. Application of Embedded System for War Field Spying Robot

The main goal of this project is to design a robotic vehicle using Radio Frequency (RF) technology for remote operation and attached with wireless camera for monitoring purpose. The robot with camera can wirelessly transmit real-time video with night vision capabilities. This type of robot can be helpful for spying purposes in war fields.

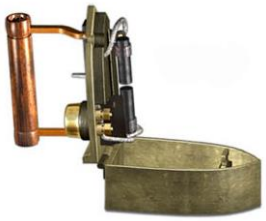
Copy the diagram and fill it with the basic structure of embedded system.



Activity 2.

For each of the picture below, mark with a ✓ if the picture is an example of embedded system, otherwise mark it with an **X**.

____1. 

____2. 

_____3. 

_____4. 

____5. 

_____6. 

____7. 

____8. 

____9. 

Activity 3.

Multiple choice. Select the letter of the correct answer.

1. What is an embedded system?
   a. Computers embedded into computers
   b. Computers that sleep
   c. Micro computers
   d. Software embedded into hardware design
2. Which device does not use an embedded system?
   a. Microwave c. Washing machine
   b. Dishwasher d. Radiator

3. Embedded systems are used as control systems. What does this mean?
a. They control desktops and laptops
b. They monitor and control machinery to achieve a result.
c. They have a way of controlling everything
d. They control what happens in any computer system.

4. The following are the characteristics of embedded system, except
   a. Manual c. Hardware & Software system
   b. Connected d. Microprocessor based

5. Which best describes the pattern that any embedded system should follow?

a. input-output-process c. process-input-output

b. process-output-input d. input-process-output

6. What is not controlled by an embedded system in a dishwasher?

a. Length of cycle c. Water pump

b. Amount of plates being washed d. Thermostat

7. Software is...

a. Microsoft Office

b. The stuff you can physically touch

c. The stuff that makes up the computer system

d. The programs or applications the computer system runs.

8. Hardware is...

a. Microsoft Office

b. Physical stuff that makes up your computer

c. The stuff you can physically touch

d. Computer programs

9. Which of the following does NOT belong to the group?

a. Actuator c. Software

b. Sensor d. Processor & ASICs

10. Which of the following statement is TRUE about embedded system?

a. Operate in real time

b. Contains microprocessor or microcontroller.

c. Part of a larger system and designed to perform a specific task or set of tasks

d. All of the above

Reflection.

Complete the statements below.

I understand_____

_____

I don't understand _____

_____

I need more information about _____

_____

Links and/or Other References

https://www.elprocus.com/real-time-applications-of-embedded-systems

https://www.elprocus.com/understanding-android-based-home-automation-systems/

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