Event-Driven Programming and Sensor Programming

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Routine of a Medical Professor in Control Flow Mode

In Office

- Research
- Write proposal
- Teaching Prep
- See out-patients
- Read reports

Outside office

- Consult students
- See ICU patients
- Teach a course
- See all in-patients
- See ICU patients
Routine of Medical Professors in Event-Drive Mode

Research
Write proposal
Teaching Prep
Answer student questions

Outside office
Student questions
Student questions
Student questions
Student questions

See all in-patients
See out-patients
Read reports
Alert Board

Teach a course

ICU patient
ICU patient
ICU patient

Interrupt / Notification

Notification
Event-Driven Programming

- Event-driven programming is a computing paradigm which allows interaction between the computer program and the user;
- The execution flow of the program is determined by
  - user actions, such as mouse clicks, key presses, sensor outputs (e.g., touch sensor), and
  - messages from other programs
- It assumes that there are unlimited number of processors available, and the events can be handled immediately.
Sensors and Actuators in Robotics Application

- Contact sensor 1
- Sonar sensor
- Contact sensor 2

Robotics Application

- Motor 1
- Motor 2
- Motor 3
Communication between Activities / Services in VPL

Activity / Service

Regular return value

Activity / Service

Additional notification signal

User Activity

Event!

Activity / Service

Data

0 1 1 0 0 0 1

Activity / Service

Signals
Data Output versus Notification Output

Control Flow

Queue

Event Driven:
All will be done at the same time, but
Types of Sensors

- Ranging sensors, such as
  - sonar,
  - ultrasonic,
  - IR, and
  - laser sensors:
- These sensors return the distance to the object.
- They typically have two lens (eyes). One sends out a light beam and the other receives the reflected beam.
- By measuring the time and angle of reflected beam, as shown in the Figure on the right, the sensors can measure the distance to the object.
Types of Sensors

There are many types of sensors

- Contact (touch) sensor: A signal is generated when touched
- Compass (magnetic) sensor
- GPS (Global Positioning System)
- Color sensor: return different value for different colors
- Temperature sensor
  Return the temperature
- Vehicle accelerometer sensor
- Vehicle tire pressure sensor
- …
EV3 and Edison Robots

Two Large Servo Motors
Ports B+C

Medium Servo Motor
Port A

Ultrasonic Sensor
Port 4

Colour Sensor
Port 3

Gyro Sensor
Port 2

Touch Sensor
Port 1
Example: NXT Robot and An Application

While (true)
{
    if touch sensor value == 1
        Trigger the motor;
    else
        if sonar distance < 3 feet
            while sonar distance < 5
                
            Trigger the motor;

}

This program will not be working without event-driven programming: Touch sensor has no chance!
Test Sensors in ASU-VPL
A Line-Follower Program Using Color Sensor