MODEL CURRICULUM FOR ROBOTIC COMPUTER PROGRAMMING

IN THE CLASSROOM

PRESENTED

FEBRUARY 9TH-2016

AT THE OETC PRE-CONFERENCE WORKSHOPS

BY PROFESSOR REED

COLUMBUS, OHIO

COLUMBUS CONVENTION CENTER

Items needed before the Workshop begins:

- Configured EV3 Brick Robot with "color sensor"

- and "sonar sensor" (provided at the event for Workshop use only!)

- Paper Line map (supplied at the Workshop)

- ROBOTC "physical robots" and/or "Virtual Worlds" software installed

- on your laptop (temporary licenses will be provided at the Workshop)

REF: (http://robotc.net/download/lego/)
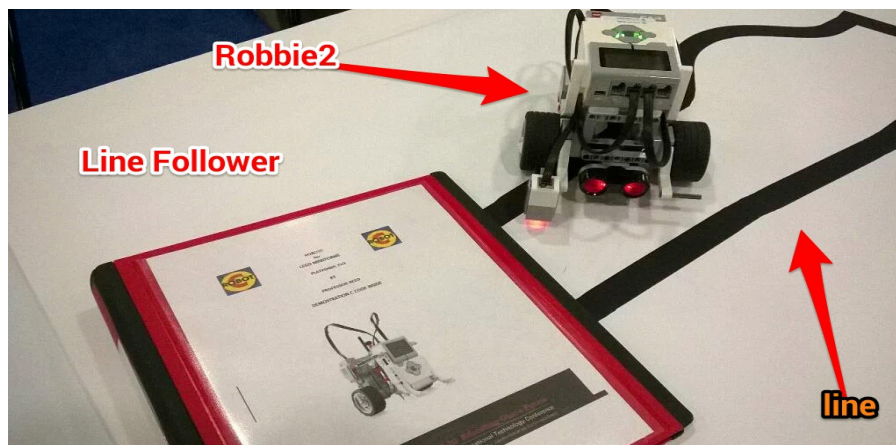
NO GUI's, NO Graphical Programming Aids, NO Mindstorms

NO pre-canned computer programming routines,

NO LEGO Block or Drag-and-Drop Programming

ROBOT COMPUTER PROGRAMMING PROJECT 1 -- LINE FOLLOWING

- ◆ Using ROBOTC (physical or virtual)

  develop a computer program to have your Robot follow

  an irregular continuous circular line utilizing the **EV3's Color Sensor.**

- ◆ <u>Your EV3 Brick Robot should be able to:</u>

- ✔ correctly follow the supplied irregular line drawing

- ✔ without assistance--autonmous actions--no assistance or joysticks.

- ✔ be picked up an placed back on the field

- ✔ and reacquire the line and correctly follow it

- ✔ once again--autonmous actions--no assistance or joysticks

- ✔ NO GUI's, NO Graphical Programming Aids, NO Block or

- ✔ NO pre-canned computer programming routines

- ✔ NO LEGO Block or Drag-and-Drop Programming, IE D&D

- ■ **Line Follower Challenge No. 1-1:**

  - ➢ Rewrite this same ROBOTC computer program

    in Python Computer Language

  - ➢ Produce the same results as above for Project No. 1

- ■ **Line Follower Line Challenge No. 1-2:**

  - ➢ Improve your ROBOTC computer code to

    include "line smoothing"

  - ➢ make your EV3 Robot

    smoothly follow the irregular line by

    elminating the back--and--forth swing as

    the Robot checks for the line edge

ROBOT COMPUTER PROGRAMMING PROJECT 2 -- OBJECT AVOIDANCE

- ◆ Using ROBOTC develop a computer program to avoid

  an obstructing object placed in its way.

- ◆ Your EV3 Brick Robot should be able to:

- ✔ detect an obstructing object placed in Robot's path way utilizing

  the **EV3's Sonar Sensor.**

- ✔ continue moving forward an appropriate number of wheel turns

  forward until encountering an obstucting object in Robot's path

- ✔ then stop and back up and try to move forward once again

- ✔ repeat object detection process; *if **needed***

  you may remove the obstructing object in the path of your robot

- ✔ to resume normal forward motion of your Robot

- **Object Avoidance Challenge No. 2-1:**

➤ Rewrite this same ROBOTC computer program

for "object avoidance" in Python Computer Language

➤ Produce the same results as above for Project No. 2

- **Object Avoidance Challenge No. 2-2:**

➤ Improve your ROBOTC computer code to

➤ correctly detect an object blocking its path ahead

➤ without assistance--autonmous actions--no assistance or joysticks.

➤ it should go directly into object avoidance mode by

➤ stopping and then turning 90 degrees Counter Clockwise (CCW)

➤ moving forward an appropriate number of wheel turns forward

➤ stopping again and now turning 90 degrees Clockwise (CW)

➤ moving forward an appropriate number of wheel turns forward

➤ stopping once again and now turning 90 degrees Clockwise (CW)

➤ NO GUI's, NO Graphical Programming Aids,

➤ NO pre-canned computer programming routines,

➤ NO LEGO Block or Drag-and-Drop Programming, IE D&D

ROBOT COMPUTER PROGRAMMING PROJECT 3 -- "COMBINATION"

LINE FOLLOWING AND OBJECT AVOIDANCE

- ✔ Take your successful computer programs written in ROBOTC from

- ✔ Projects 1 & 2 above and combined them into a singule integrated

    program that allows your Robot to follow the irregular line--from Project 1

- ✔ and encounter an object in its path (Project 2) avoid the object

- ✔ autonmous actions only--no assistance or joysticks or human assistance

- ✔ go around the obstructing object as indicated

- ✔ (start avoidance: stop, turn 90d CCW, frwd step(s), stop, turn 90d CW, frwd step(s), stop, turn 90d CW, frwd step(s), stop, turn 90d CCW, end avoidance: begin again going forward using line following)

- ✔ reacquire the irregular line

- ✔ and continue the line following

Line Follower and Object Avoidance Challenge No. 3-1:

- ➢ Rewrite your working ROBOTC combo project in

    Python Computer language.