Week 2 – Basic Constructs 1

- Sequential
- Conditional branching
- Looping

Last week

- Introduced
  - Stepwise refinement
  - There is often more than one solution to a problem
  - Discussion and working in groups is a useful technique to include in problem-solving.

Sequences

- Instruction 1
- Instruction 2
- Instruction 3
Sequences

- The instructions follow on from each other, always the same.

Sequences

- Starting at the first and ‘flowing’ down.

Conditional Statements

- If test 1 is true do instruction 1
- If test 2 is true do instruction 2 if false do instruction 3
Conditional Statements

- The flow of the program can be altered by whether a test is true or not.

Looping

- Instruction 1
- Instruction 2
- Go back to instruction 1

- Sometimes we want to repeat a list of instructions.

Looping - with a test

- Instruction 1
- Instruction 2
- Go back to instruction 1 if test is true

- Repeat a list of instructions, but only if a test is true.
Problem 2.1

- A routine to calculate a tip based on the overall service.
  - No tip if the service is poor
  - 10% tip if the service is okay
  - 15% tip if the service is good or better

Problem 2.1 – Problems

- What does poor, okay or good mean?

Problem 2.1 – Problems

- How do we quantify these?
  - We could use marks out of 10.
  - <3 for poor
  - 3<=marks<=8 for okay
  - >8 for good
Problem 2.1– Problems

- What is our tip a percentage of?
  - We know this is going to be a percentage of the price of the bill.

Analysis

- Inputs needed
  - Price of the meal
  - Marks for service

Analysis

- Outputs
  - Price + tip
Analysis

- Rules
  - <3 for poor
  - 3<=marks<=8 for okay
  - >8 for good

Design

- Input the price
- Input the marks out of 10
- If marks<3 then Tip=0;
- If 3<=marks<=8 then Tip=Price*0.1;
- If marks>8 then Tip=Price*0.15
- Display Tip+price

Problem 2.2

- What would be have to do the previous routine if we want it to calculate if want to repeated calculated tips?
Problem 2.2

- One of the basic constructs is the loop.
- The next question is what to loop?
  - In this case all the routine needs to loop.

Start of loop 1
- Input the price
- Input the marks out of 10
- If marks<3
  - Tip=0;
- If 3<=marks<=8
  - Tip=Price*0.1;
- If marks>8
  - Tip=Price*0.15
  - Display Tip+price
- Go back to start of loop 1

convention
- instructions that are the result of a particular conditional statement or loop are indented below it signify they belong to that instruction.
Problem 2.3

- Design a system to make the robots you met last week move towards a wall, detect the wall is there and reverse backwards and turn to the right 90 degrees.

Problem 2.3

- Let’s experiment: In small groups use drawings (does need to be neat) to express your ideas while you thinking about this as a group. Then write down your choosen solution as a set of instructions.

Start of one possible solution (needs expanding)

- Move the robot forward
- Check if the wall is detected
- If wall is detected then
  - Go back wards
  - Turn to the right 90 degrees
- Repeat this whole process
Problem 2.4:
- Write down a detailed list of instructions to open a bottle.
- Have a go yourselves
- Have you thought of all situations?

Problem 2.5
- Wall-following robot
  - Keeps the wall to its right and follows the contour of the room.
  - It can touch the wall.

Problem 2.6
- Try problems 2.3 or 2.5 with different sensors.