Escola Superior de Tecnologia e Gestão Instituto Politécnico da Guarda	**Laboratorial Work**

Nº 9			
Group: 3.1 ←Identify your group			
Number	1012164	Name	Carina Tomé
Number	1012208	Name	Dário Ribeiro
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Number	1012396	Name	Rui Manta

Fill in the header record with the names and numbers of the group members and add "(missing)" next to the name, in case any member of the group missed the class. After finishing the laboratorial work, create a PDF doc called "Grupo X.X – LW X.PDF" submit it via the form at http://bit.ly/2TL0lKS.

If the answers to the questions is Java code, you must use color black and font Courier New, size 10, to write the code. Also, indent all the code. A penalty of 50% will be applied if you forget to do this.

The answer to this question is only valid if you demonstrate it to the professor, during this class.

1. Make the robot to return to the start position (white circle) after the flame is extinguished in any of the rooms.

   Tip: Implement the navigation to return to the start position in a new state of the finite state machine called RETURN. When in this state, the robot navigates by following the walls, until it detects the white circle. Notice that the robot cannot enter completely in a room while returning to the start position and the time limit to return is 30 seconds.

Declaration of new constants, if any

```
private static final int RETURN = 4;
private static final int MIN_DISTANCE_LEFT = 15; // Minimum distance to left wall.
```

Declaration of new objects and variables, if any

```
private static int mode;
```

Creation and initialization of objects and variables, if any

```
mode = 0;
```

New functions, if any

```
private static int returnState(int mode) {
checkBumpers();
if(mode == 0) {
if (getDistance(mFrontSonar) < MIN_DISTANCE_FRONT) {
```

```
rotateAngle(90);
}
int delta = (int) ((getDistance(mRightSonar) - MIN_DISTANCE_RIGHT) * GAIN);
delta = (delta > DELTA_LIMITE ? DELTA_LIMITE : delta);
move(BASE_POWER, delta);
}if(mode == 1) {
if (getDistance(mFrontSonar) < MIN_DISTANCE_FRONT) {
rotateAngle(-90);
}
int delta = (int) ((getDistance(mLeftSonar) - MIN_DISTANCE_LEFT) * GAIN);
delta = (delta > DELTA_LIMITE ? DELTA_LIMITE : delta);
move(BASE_POWER, -delta);
}
int floorTag = getFloorTag();
if (floorTag == CIRCLE_TAG) {
if (mFlame == true)
maneuverToReturnBack();
else
return WAIT;
}
return RETURN;
}
```

Call of the new functions, if any

It was created a new case in the state machine.

```
case RETURN:
      state = returnState(mode);
break;
```

New code, if any

In the putOutState function was added code after the robot extinguish the flame.

```
private static int putOutState() {
      mFan.setPower(16);
      wait(2000);
      mFan.setPower(0);
      mFlameLED.clear();
      mFlame = false;
      if(mRoom < 2) {
mode=0; //Navigate by the right, it's for the 3rd room and the island
}else {
mode=1;//Navigate by the left, it's for the 1st room and the 2nd
      }
      return RETURN;
}
```