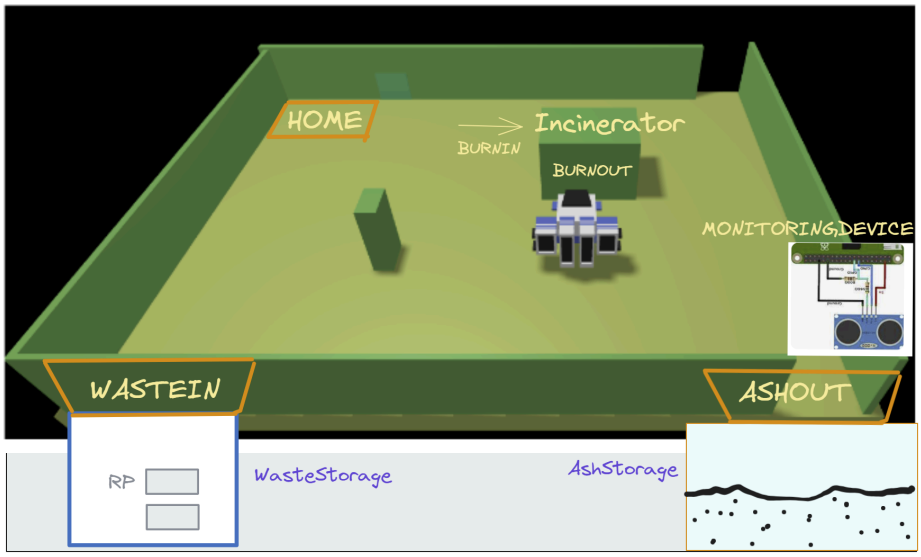
TemaFinale24

A company intends to build a **WasteIncineratorService** to treat waste by burning it and requires a software system service (*WIS*) that controls a robot (called *OpRobot*) in order to move the waste.

The structural part of the building

THe *Incinerator* is situated within a service area (rectangular, flat) as shown in the following picture:



Outside the service area, there are:

1. a *WasteStorage* container, devoted to store waste material in the form of Roll Packets (*RP*). Each *RP* has a weigth *WRP* = **50 Kg** (approximately);
2. a *AshStorage* container, devoted to store the ashes produced by the incineration process. This container can store (approximately) the ashes of **3-4** *RP*.
3. a *MonitoringDevice*, composed by a a *Sonar* and a *Led* working on a RaspberryPi.

The waste can be introduced into the *Incinerator* through its BURNIN port, while the ash produced by the *Incinerator* can be extracted using the BURNOUT port.

The service area includes:

1. a WASTEIN port, that can be used to enter into the service area the *RP* of waste.
2. a ASHOUT port, that can be used to move out of the service area the ash produced by the incineration process.

The behavior of the *Incinerator*

- The *Incinerator* is able to perceive a proper activation command sent by using a wireless (*wifi, bluetotth*) connection.
- The *Incinerator* can process one *RP* at the time. The burning process requires (approximately) *BTIME* seconds.
- At the end of a burning phase, the *Incinerator* emits a (acustic, or other) signal that can be perceived by the *OpRobot* and by the *WIS*.

The behavior of the *OpRobot*

The company provides a *DDR robot* (and its own control software), that should be used as the physical actuator for the behavior of the *OpRobot*, that can be listed as follows:

1. stay in the HOME location when the is no work to do;
2. if the *WasteStorage* container is not empty, the *AshStorage* container is not full, and the *Incinerator* is not in a burning phase, move to the WASTEIN port. If one of the conditions is **not true**, wait at HOME, until it becomes *true*.
3. get a *RP* from the *WasteStorage* container;
4. move to the *BURNIN* port and deposit the *RP* into the *Incinerator*;
5. move to the HOME location when the *Incinerator* is in its burning phase;
6. move to the *BURNOUT* port to extract the ash, when the *Incinerator* has completed a burning phase;
7. move to the ASHOUT port and deposit the ash into the *AshStorage* container;
8. reconsider the point **2** (and go back to HOME, if it is the case).

The management of Containers

- A new *RP* is put into the *WasteStorage* container by some external agent.
- The *WasteStorage* owns a *weighing device* (*Scale*) that reports the current weigth af all the *RP* currently stored into the container. The container can be considered empty when the value of the *Scale* is (approximately) **0**.

- Onother exetrnal agent provides to remove the ash from the *AshStorage* container. This actions modifies the value measured by the *Sonar* of the *MonitoringDevice*.

The *WIS* can acquire information from the input devices *Scale* and *Sonar* through software supports that must be properly designed and implemented.

The ServiceStatusGUI

The *WIS* system must also provide a **ServiceStatusGUI** (*SSGUI*) that must show:

1. the current state of the *WasteStorage*, i.e. the number of *RP* currently stored in it;
2. the current state of the *AshStorage*, i.e. an indication of the level of its capacity currently used;
3. the current state of the *Incinerator*, i.e. if it burning or not;
4. the state of the *OpRobot*, i.e. an indication of its current location in the service area and of the job that it is doing.

The behavior of the MonitoringDevice

The *Sonar* of the *MonitoringDevice* is used to measures the level of the ash in the *AshStorage* container, by measuring the distance between the top of the ash and the *Sonar* itself. When the distance is less than a prefixed value **DLIMT**, the *AshStorage* container is considered full.

The *Led* is used as a *warning device*, according to the following rules:

- the *Led* is **on** when the *Incinerator* is burning a *RP*.
- the *Led* is **off** when the *Incinerator* is not burning.
- the *Led* **blinks** while the *AshStorage* is full or the *AshStorage* is empty

Service users story

An an user of the *WIS*, I see that:

1. The *OpRobot* is somewhere in the service area (initially in the HOME location).

2. If the *WasteStorage* container is not empty, and *AshStorage* container is not full, (i.e. the *Led* is not blinking) and the *Incinerator* is not burning, the *OpRobot* moves to the WASTEIN port and gets a *RP* from the *WasteStorage* container. Otherwise, if returns to HOME, if not already here.
3. Fron now on, *The ServiceStatusGUI* shall properly change (part of) its content.
4. The *OpRobot* moves to the BURNIN port and deposits the *RP* into the *Incinerator* (the *Led* is on).
5. While the *Incinerator* is burning, the *OpRobot* moves to its HOME port.
6. Whan the *Incinerator* has completed a burning phase, the *Led* is off, and the *OpRobot* moves to the BURNOUT port, picks up the ash and moves to the ASHOUT port.
7. The *OpRobot* deposits the ash into the *AshStorage* container and the *Sonar* gives a value less the the previous one.
8. The *OpRobot* restarts from point **1**.