Name : Donovan Sim Yew Wee (153492Y)

Foo Jing Ting (152856H) Comments :

Group : Group 32

**Proposal/Report: Assignment 2 (Collaborative AI)**

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**Instructions**

Create 2 FSMs (minimum 3 state) each with trigger conditions and responses.

Design the FSMs to support or help each other in team play through message boarding.

Each FSM (its object) should send 1 message and respond to 1 message.

Responses can be seen via HUDs or other forms of suitable notifications.

**Game Scenario**

In a robot factory production line, there are machines that produce parts to build robots. The maintenance men repair the machines if they break down. Workers assemble the parts to form up the robot at their own workstations. Sometimes, the people need to have a toilet break.

Completed robots come to life, and start to build ornaments that are to be delivered away. When the robot reaches the end of its lifespan, it shuts down and is brought away by the scrap-man. The scrap-man breaks down the robot into scraps at his station, then the maintenance man delivers the scraps to the machines to refill them.

The supervisor oversees the events in the factory, and gives orders to increase urgency, or for a staff to temporarily do a different job where help is required.

**Additional Features, Improvements & Bonuses:**

* **[Donovan]** Add a supervisor Entity – Sends instructions to factory staff when there is a change in situation. Also can send urgency messages. Also patrols around the factory (randomised waypoints).
* **[Jing Ting]** Day/night cycle – factory staff might go on (medical) leave on some days. Only max of one per day.
* **[Jing Ting]** Change of roles (symbol of the new role will be rendered on top):
  + If a Worker goes on MC, either a Maintenance Man or Scrap Man will replace the Worker for the whole day.
  + If there are too many Machines broken/need refill or if a Maintenance Man goes on MC, any of the other humans will temporarily become a Maintenance Man. They change back after completing the task.
  + If there is a Robot powered down or if a Scrap Man goes on MC, any of the other humans will temporarily become a Scrap Man. They change back after completing the task.
* **[Donovan]** Add sense of urgency – e.g. change movement velocity when there is a jam.

**FSM #1: Machine (Donovan)**

States

The machine starts off in **rest**. After resting for 5 seconds, it goes into **production** state, where it produces the parts (takes 5 secs). Each complete production increases the machine’s heat. During production, there is a chance the machine may **break down** based on the machine’s heat percentage and requires repairs before it can continue. When it finishes production, the part will be sent out onto the conveyor belt, and the machine returns to **rest** state. When it is to start production again, it will check for whether it has enough scrap parts. If it does not have enough, it will **wait** until scraps are delivered to it before it goes into production. When the factory closes in the evening (6pm), it will **shut down**.

Conditions

The machine starts off in rest. After **resting** **for 5 seconds**, it goes into production state, where it **produces the parts (takes 5 secs)**. Each complete production increases the machine’s heat. **During production,** **there is a chance the machine may break down based on the machine’s heat percentage** and **requires repairs** before it can continue. When it **finishes production**, the part will be sent out onto the conveyor belt, and the machine returns to rest state. When it is to start production again, it will check for whether it has enough scrap parts. If it **does not have enough**, it will wait **until scraps are delivered to it** before it goes into production. When the **factory closes in the evening (6pm)**, it will shut down.

State Transition Diagram



**FSM #2: Worker (Donovan)**

States

The worker stays **idle** until a machine’s product reaches his workstation. Then, he will go into **work state** to assemble the products (takes 4 secs), then sends it continuing along the conveyor belt when completed. After completing his work, the worker goes back to **idle state**. Sometimes, the worker needs to take a **break** (based on a charge meter that increases at a random rate over time), so he will go to the toilet for a while (takes 4 secs). When the factory closes in the evening (6pm) and his work is done, he will **end work** and leave the factory.

Conditions

The worker stays idle **until** **a machine’s product reaches his workstation**. Then, he will go into work state to **assemble the products (takes 4 secs)**, then sends it continuing along the conveyor belt when completed. After **completing his work**, the worker goes back to idle state. Sometimes, the worker **needs to take a break** **(based on a charge meter that increases at a random rate over time)**, so he will go to the toilet for a while (takes 4 secs). When the **factory closes in the evening (6pm) and his work is done**, he will end work and leave the factory.

State Transition Diagram



**FSM #3: Maintenance Man (Donovan)**

States

The maintenance man starts off **idle**. When a machine requires refills, he takes the scraps from a pile, and brings them to the machines to **refill** them (takes 4 secs). When a machine breaks down, the maintenance man goes to the machine to **repair** it (takes 4 secs). Sometimes, the maintenance man needs a **break** (based on a charge meter that increases at a random rate over time), so he will go to the toilet for a while (takes 4 secs). When the factory closes in the evening (6pm) and his work is done, he will **end work** and leave the factory.

Conditions

The maintenance man starts off idle. When **a machine requires refills**, he takes the scraps from a pile, and brings them to the machines to refill them **(takes 4 secs)**. **When a machine breaks down**, the maintenance man goes to the machine to repair it **(takes 4 secs)**. Sometimes, the maintenance man **needs a break** **(based on a charge meter that increases at a random rate over time)**, so he will go to the toilet for a while **(takes 4 secs)**. When the **factory closes in the evening (6pm) and his work is done**, he will endwork and leave the factory.

State Transition Diagram



**FSM #4: Robot (Jing Ting)**

States

The robot starts in **incomplete** state and is worked on by workers. The robot goes into **start-up state** when it is fully assembled, where it takes 3 seconds to start up. After being booted up, the robot begins **work**. It walks to a pile of bricks, then picks up a brick. It then walks towards the final product assembly station, where it puts down the brick, then walks back. When one ornament is completed, all the robots will stop to **do a victory cheer** for 4 seconds, then continue work. When the robot has lived for more than 60 seconds, there will be an increasing chance where it will **shut down** and stop moving, with a guaranteed shut down at 100 seconds. When the factory closes in the evening (6pm), it will go into a **powered off** state.

Conditions

The robot starts in incomplete state and is worked on by workers. The robot goes into start-up state **when it is fully assembled**, where it **takes 3 seconds** to start up. After being **booted up**, the robot begins work. It walks to a pile of building blocks, then picks up a part. It then walks towards the final product assembly station, where it puts down the block, then walks back. **When one ornament is completed**, all the robots will stop to do a victory cheer **for 4 seconds**, then continue work. When the **robot has lived for more than 60 seconds, there will be an increasing chance** where it will shut down and stop moving, **with a guaranteed shut down at 100 seconds**. When the **factory closes in the evening (6pm)**, it will go into a powered off state.

State Transition Diagram



**FSM #5: Deliveryman (Jing Ting)**

States

The deliveryman is **idle** when there is no product to pick up. When the robots finish building the product, the delivery truck **drives** into view from the bottom of the screen. When the truck is near the product it comes to a stop, and the deliveryman comes out of the vehicle, **walks** to the product. When he reaches the product, he **carries the product up** and brings it back to the truck. Then, the deliveryman gets back onto the vehicle and **drives** off.

Conditions

The deliveryman is idle **when there is no product to pick up**. When the **robots finish building the product**, the delivery truck drives into view from the bottom of the screen. **When the truck is near the product** it comes to a stop, and the deliveryman comes out of the vehicle, walks to the product. **When he reaches the product**, he carries the product upand brings it back to the truck. Then, the deliveryman **gets back onto the vehicle** and drives off.

State Transition Diagram



**FSM #6: Scrap-man (Jing Ting)**

States

The scrap-man starts **idle**. When a robot breaks down, he will **walk** to it, pick it up, and bring it to his workstation. At his workstation, he **breaks down the robot** into scraps (takes 5 secs). When completed, he will leave it in a pile of scraps. When his work is completed, he returns to **idle state**. Sometimes, the scrap-man needs a **break** (based on a charge meter that increases at a random rate over time), so he will go to the toilet for a while (takes 4 secs). When the factory closes in the evening (6pm) and his work is done, he will **end work** and leave the factory.

Conditions

The scrap-man starts idle. **When a robot breaks down**, he will walk to it, pick it up, and **bring it to his workstation**. At his workstation, he breaks down the robot into scraps **(takes 5 secs).** **When completed**, he will leave it in a pile of scraps. **When his work is completed**, he returns to idle state. Sometimes, the scrap-man **needs a break** **(based on a charge meter that increases at a random rate over time)**, so he will go to the toilet for a while **(takes 4 secs).** When the **factory closes in the evening (6pm) and his work is done**, he will endwork and leave the factory.

State Transition Diagram



**FSM #7: Supervisor (Donovan)**

States

The supervisor starts **idle**. Once every few hours, he will **patrol** around the factory (randomised destinations to walk to). After covering enough patrol distance (30 grid units), he walks back to his desk and returns to **idle state**. When a message that requires consideration is sent to the message board, the supervisor will have to **make a decision**. Sometimes, the supervisor needs a **break** (based on a charge meter that increases at a random rate over time), so he will go to the toilet for a while (takes 4 secs). When the factory closes in the evening (6pm) and his work is done, he will **end work** and leave the factory.

Conditions

The scrap-man starts idle. **Once every few hours**, he will patrol around the factory (randomised destinations to walk to). After **covering enough patrol distance (30 grid units)**, he walks back to his desk and returns to idle state. When **a message that requires consideration** **is sent** to the message board, the supervisor will have to make a decision. Sometimes, the supervisor **needs a break** **(based on a charge meter that increases at a random rate over time)**, so he will go to the toilet for a while **(takes 4 secs).** When the **factory closes in the evening (6pm) and his work is done**, he will endwork and leave the factory.

State Transition Diagram



**Message Board (Jing Ting)**

*\*message board saves up to 4 of the latest messages. When a message has been acknowledged by the intended recipient, the message will change to green.*

*\*When a message is sent out, intended recipients and the Supervisor will receive a notification (an envelope appears above their head).*

*\*When a message has been acknowledged, a tick will appear above the Entity that acknowledged it.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Text** | **From** | **To** | **Response (Output)** | **Remarks** |
| I am broken. | Machine | Maintenance Man | Maintenance Man goes to repair Machine. |  |
| I need refills. | Machine | Maintenance Man | Maintenance Man takes scrap from the pile, and goes to refill Machine. |  |
| I have shut down. | Robot | Scrap-Man | Scrap-Man goes to Robot’s location and moves it to his workstation. |  |
| An ornament is completed. | Ornament System | Delivery Man | Delivery Man makes the ornament the ornament to collect. |  |
| Replace <person>. | Supervisor | Worker / Maintenance Man / Scrap-Man | The factory staff will take over the role of the missing staff. He will have a “TEMP” hat rendered over his head. | This is a role change. |
| Increase urgency. | Supervisor | All Human Staff (Worker, Maintenance Man, Scrap Man) | Everyone’s movement velocity increases. |  |
| Go back to normal speed. | Supervisor | All Human Staff (Worker, Maintenance Man, Scrap Man) | Everyone’s movement velocity returns to normal. |  |