

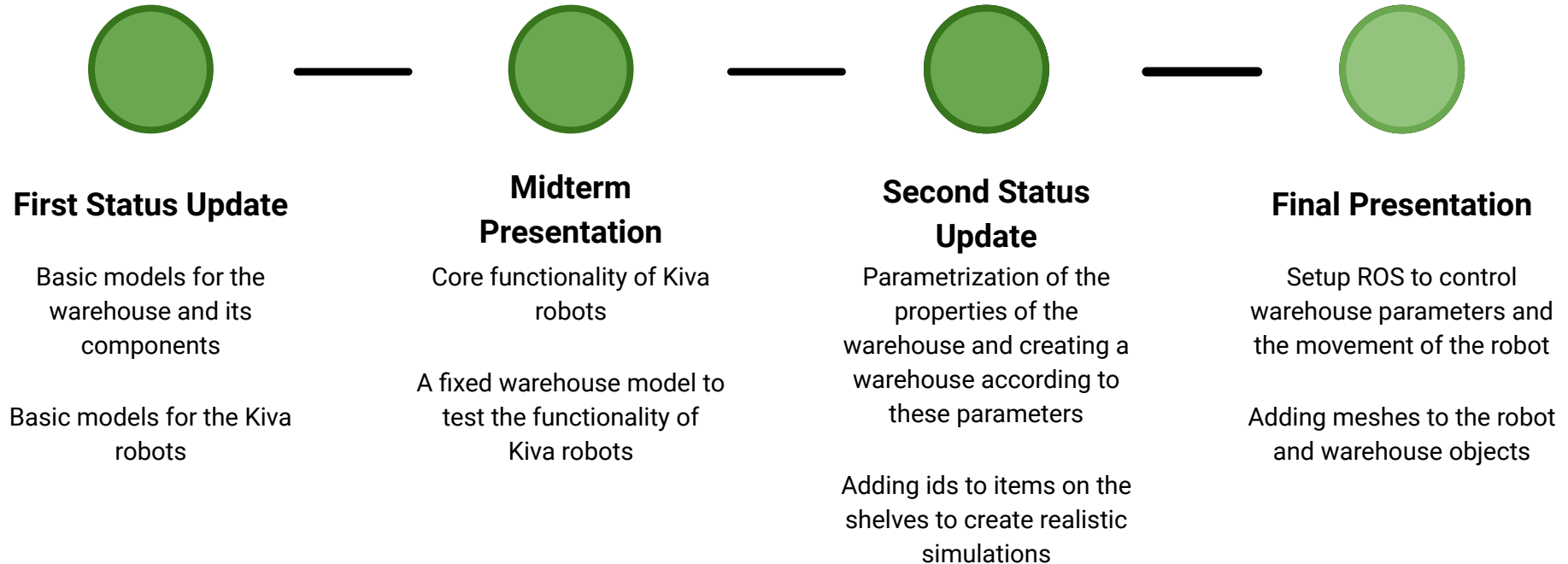
# Modelling the Environments and the Robots

Final Presentation

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# Timeline

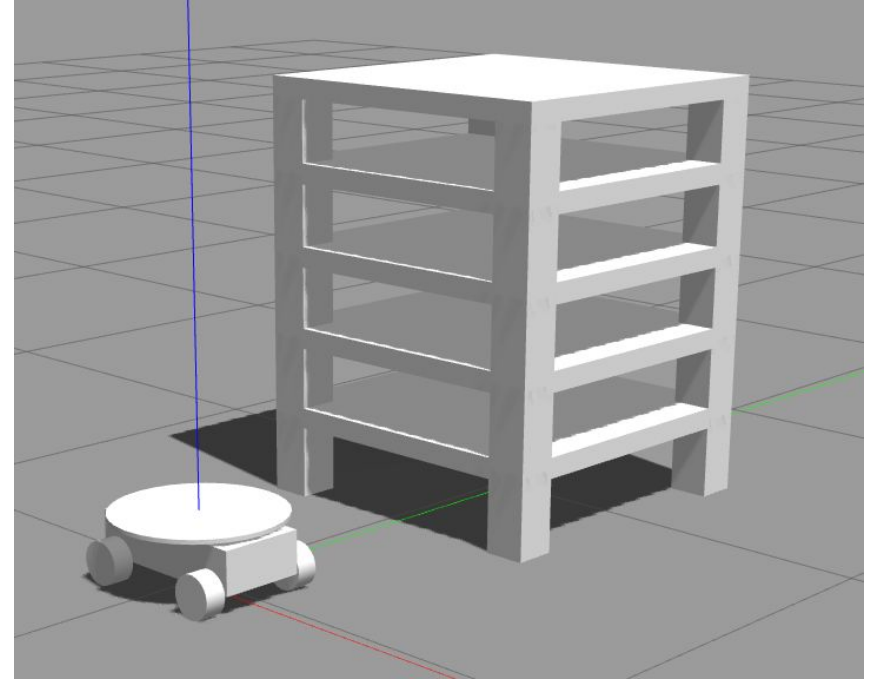


# Milestones

- ❑ Modelling the Kiva robots with sensor, actuator and transmitter functions
- ❑ Modelling a simple warehouse
- ❑ Controlling the robots for some basic tasks in a static warehouse model
- ❑ Adding sensors to robots for collision detection
- ❑ Pub-sub & server-client to retrieve and publish commands to warehouse and robots
- ❑ Adding ids to items in the storage units to control which items are being carried
- ❑ Parametrization of warehouse attributes (size of the warehouse, number of kiva robots and conveyor belts)

# Functionality

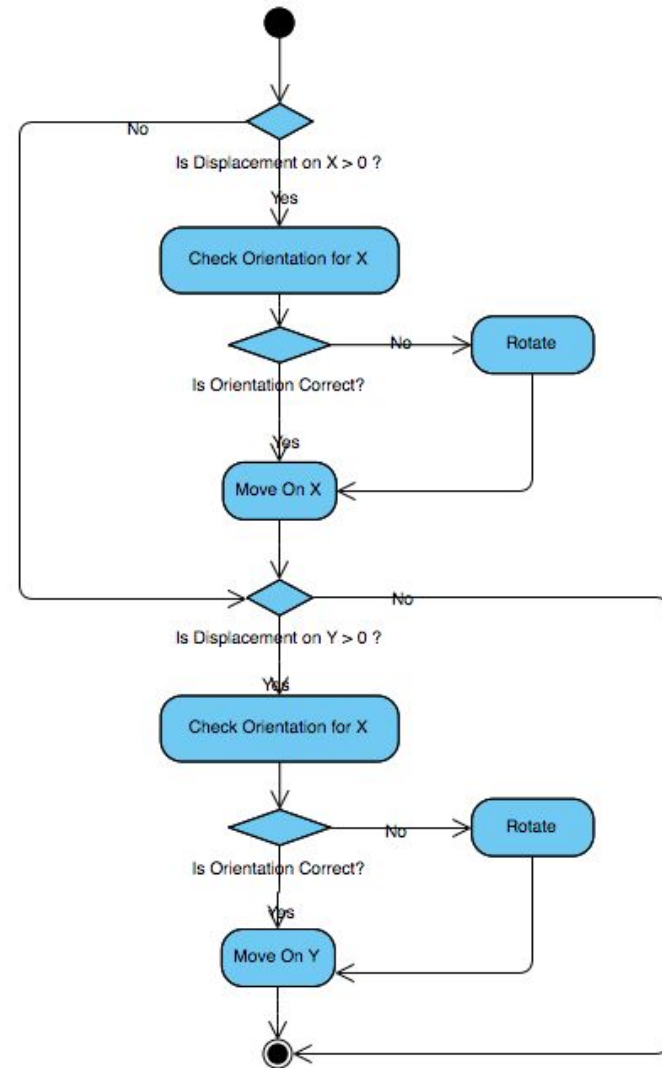
- Warehouse
  - Spawn Shelves
  - Spawn Robots
  - Spawn Items
- Kiva Robot
  - MoveToCoordinates
    - Rotate
    - Orient
    - Move
  - Lift



# Move to Coordinates

- Kiva States

- Idle
- Busy
  - Rotating
  - MovingOnX
  - MovingOnY
  - Blocked



# Gazebo

- Subscriber
  - /kiva/mov to listen for next coordinates
  - /kiva/lift to listen for lifting
  - /pose/info to get world information
- Publisher
  - /kiva/status to publish robot (0: idle 1: busy 2: blocked)
- Sensors
  - Publisher
    - /kiva\_{id}/chassis/laser/scan to get distance information for collision detection

# ROS

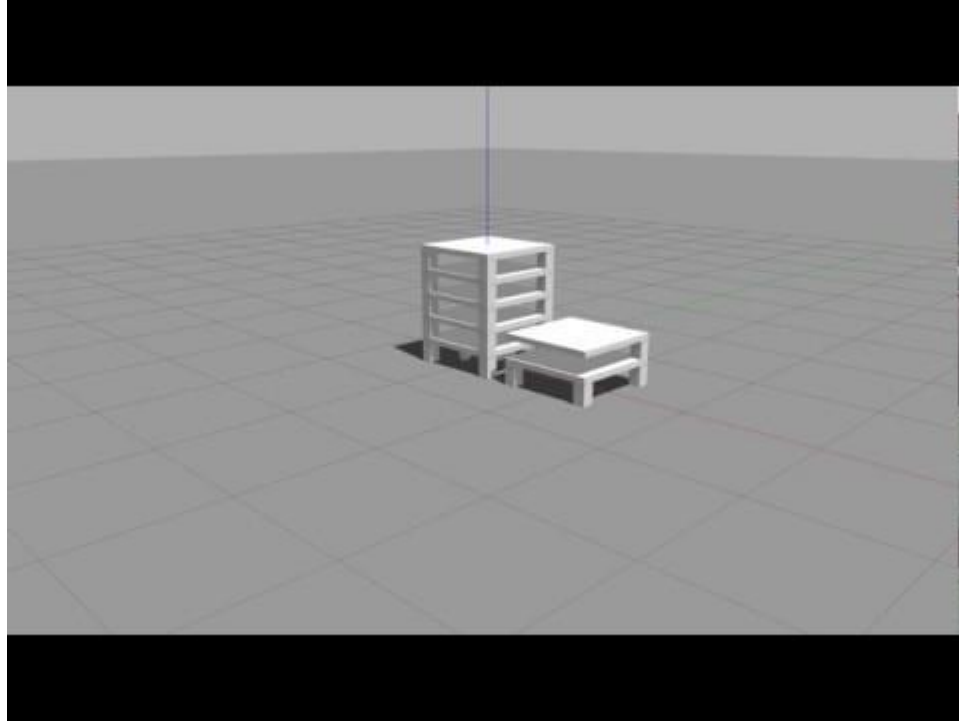
- Service
  - `/warehouses/create_warehouse_models` - spawn storage units, items and robots
  - `/get_model_state` - get model state at a point in time
- Client
  - `/warehouses/create_warehouse_models` - input for warehouse creation
- Subscriber
  - `/model_states` - get current state of world
- Publisher
  - `/items/item_{id}/pose` - publish item\_id with pose to locate in world
  - `/storage_units/storage_unit_{id}/pose` - publish storage units' pose in world
- Nodes
  - `create_warehouse_service_node` - spawn and manage models
  - `create_warehouse_topics` - initialize warehouse topics
  - `track_items_node` - track items in warehouse with pose
  - `track_storage_units_node` - track storage units in warehouse

# Gazebo - ROS communication

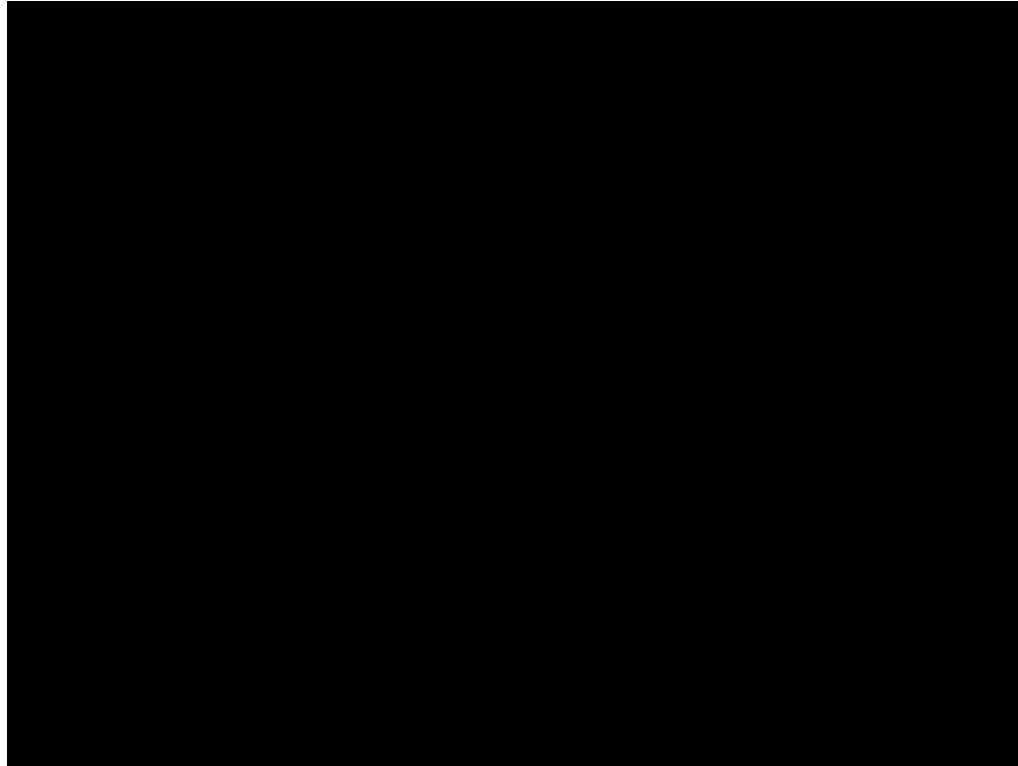
- Implicit
  - `/spawn_sdf_model` -> `/gazebo/SpawnModel`
  - `/get_model_state` -> `/gazebo/GetModelState`
- Explicit
  - `/kiva/mov` -> `/kiva/mov` control movement of robots
  - `/items/item_{id}` -> `/get_model_state` get pose of items
  - `/storage_units/storage_unit_{id}` -> `/get_model_state` get pose of storage units
  - `/lift` -> `/lift` control lift for robots and storage units



# Demo



# Demo



# Final Steps

- Adding meshes to robots and warehouse objects
- Refactoring our code
- Expose Low Level APIs - `moveOnX()`, `moveOnY()`, `rotate()`

# Questions