



tēmi

THE PERSONAL ROBOT

OVERVIEW



Objectives

Human detection flow

State Machine

Tracking Flow

States

Lost target routine

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Depth node overview

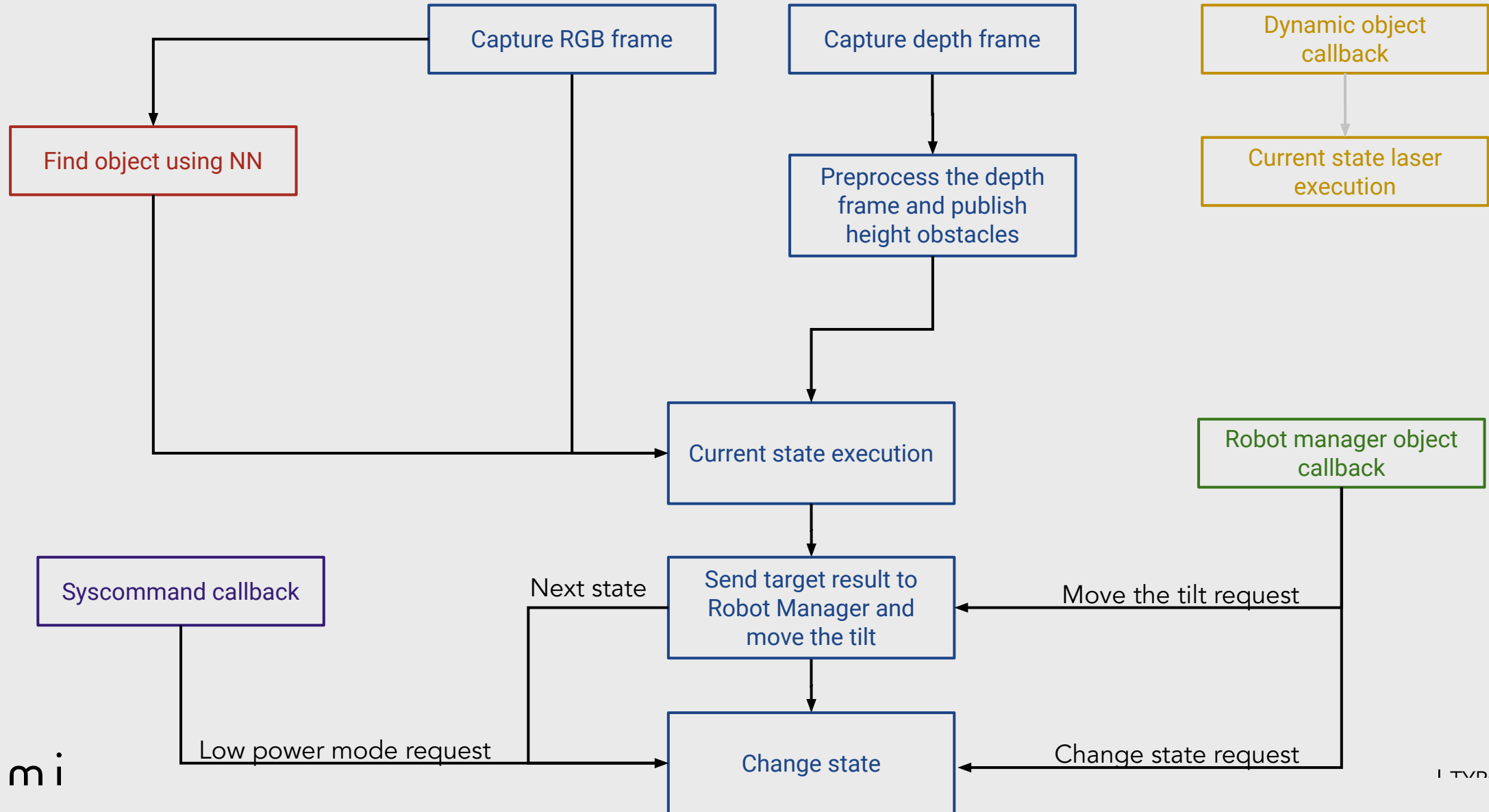
Objectives

- Support the follow mode, by providing the robot manager with the target's position, using the robot's cameras.
- Two cameras - RGB and Depth.
- Apply computer vision and machine learning algorithms to detect and follow humans.
- Map the robot's surroundings and feed the local obs node with height obstacles.
- Control the tilt's movement.
- Constantly publish if there is human in the frame and his direction.

- Each color represents a different thread

State Machine

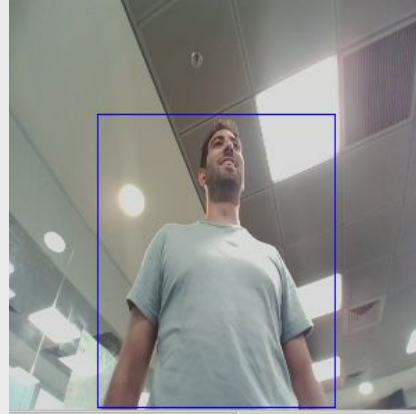
AKA - The Depth Machine



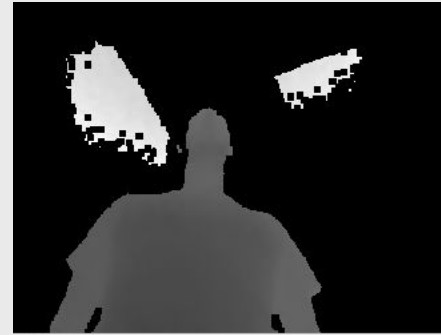
States

	Description
Idle	The default state, height obstacles are being published and laser targets are being updated.
Init	Activated when following mode trigger arrives from the robot manager, its goal part is to get identification and classification of the person standing in front of the robot. and give the tracking state its initial target
Tracking	This state's objective is to track the person, it starts with the init state location and keeps the target focused to upper part of the frame.
Searching	Activated after the tracking state does not find target. Finds the direction of target lost, and decides what to accordingly.
Snap To User	Activated when trigger word is launched, finds the person's location and moves the tilt. Similar to init, but does transfer to tracking after finding a person.
Low Power Mode	The state machine keeps running only capture rgb frames, in order to revive quickly after the robot exits the low power mode. The depth camera and the ssd routine are turned off .

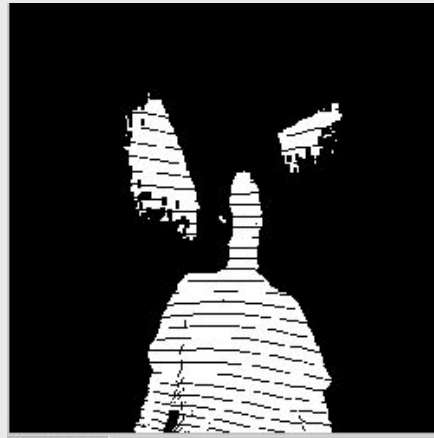
Human detection flow



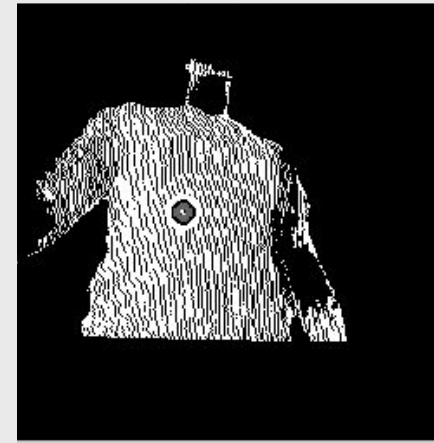
The NN verifies the object in front of the robot is a person, producing a bounding box.



The filtered depth image is cut to the bounding box's measurements



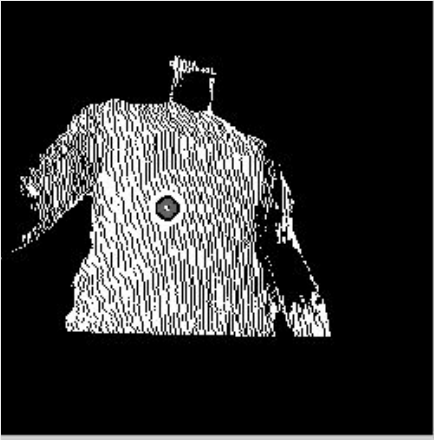
In the registration matrix, we find if there are enough "close" pixels in the frame. Another output is the distances histogram.



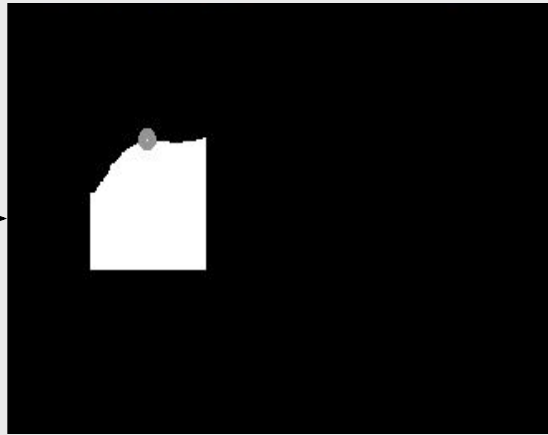
With the histogram results, we can find the initial target's depth, and its x,y location

Tracking Flow

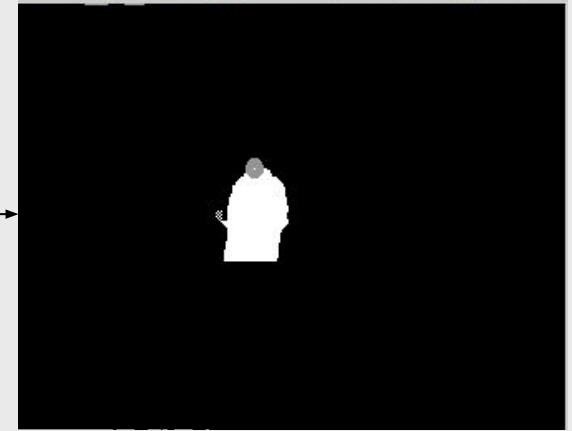
- The initial target position is found in the "init" state.
- The tracking algorithm, for now, is based on the depth camera.
- The algorithm is based on centering the object around the desired spot in the depth frame.
- Finds the highest pixel with the depth in every frame, and align the frame according.
- For keeping low cpu usage - each frame uses the previous frame's zone of interest.



Init track capture

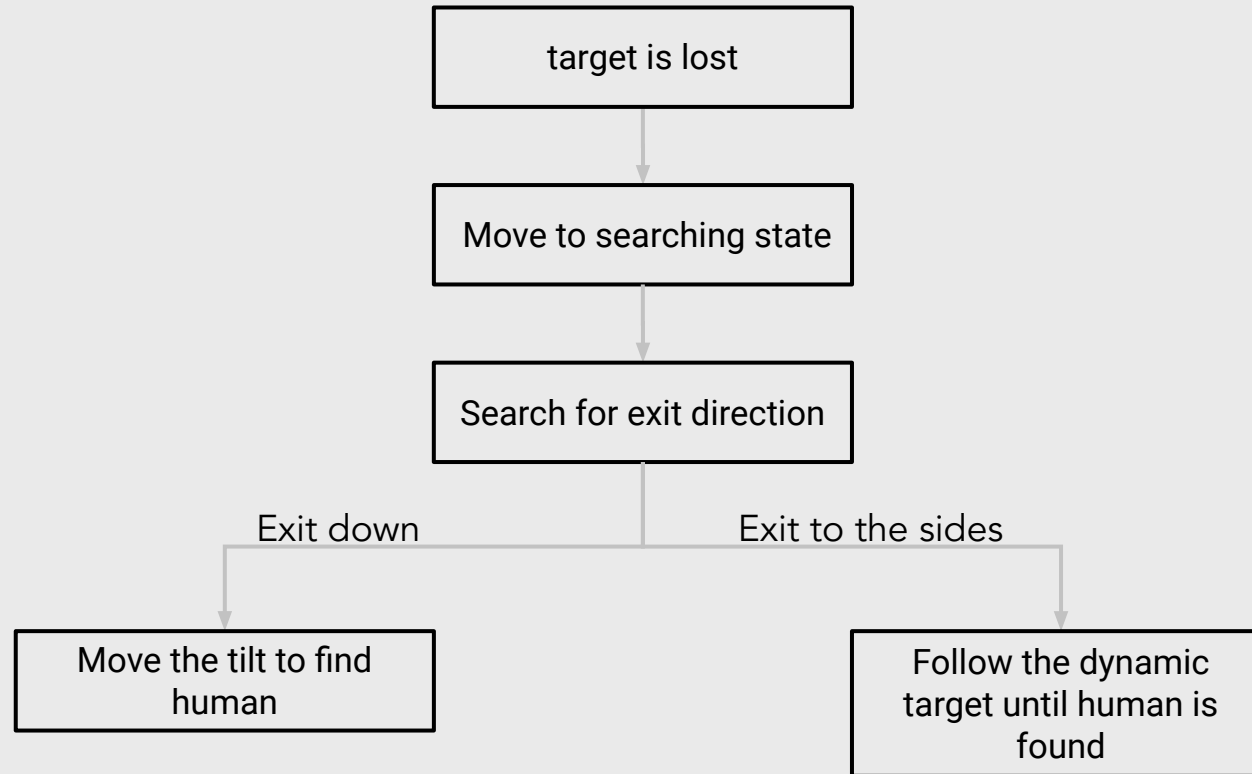


First tracking frame
(caught the shoulder)



After tilt alignment
(Fixed on the top of the head)

Lost target routine



THANK YOU

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