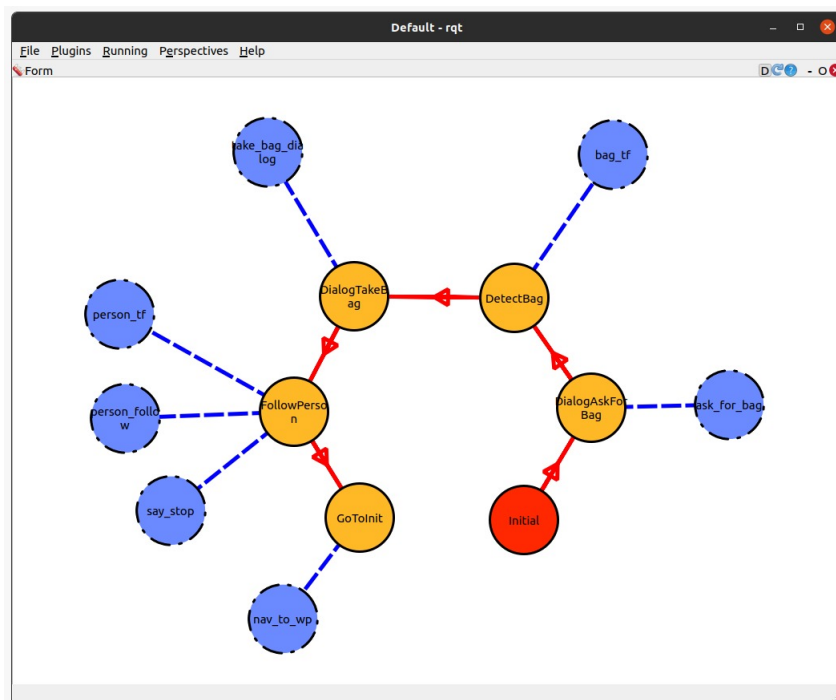# Technical Paper

DisasterBots

May 23, 2021

Abstract. The present document serves as a detailed description of the solutions proposed by DisasterBots to the tasks proposed on Robocup@Home Education (Online Challenge 2021).

Task 1: Carry My Luggage

To develop this task we have used BICA:
https://github.com/IntelligentRoboticsLabs/BICA/tree/no_planning
This tool is used to create an state-machine where different nodes will be activated in each state.

We have the following states:

- **Initial**
- **DialogAskForBag:** The robot listens a person ask for carrying a bag and the robot replies.
- **DetectBag:** Extraction of the central point of the bag using YOLO and point-cloud and then, that point is transformed and published.
- **DialogTakeBag:** The robot asks to the person that leaves the bag on it and waits for it. Then, the robot said that the person has to said "follow me".
- **Follow Person:** This state actives three dependencies. The first one (person tf) consists on revolve around itself until detecting a person with YOLO. Then, it extract the middle point of the person using the point-cloud and publishes the point transformed. The second node (person follow) takes the point transformed and navigates until reach 1 meter of distance to avoid run over the person. This one communicates with the first by a service to indicate if the robot is navigating or not. Finally, the last node (say stop) listens the person. When person says "stop", the state finished and activates the last one.
- **GoToInit:** The robot navigates to the initial point. It avoids obstacles using the point-cloud (point-cloud to laser-scan).

Task 2: Find My Mates
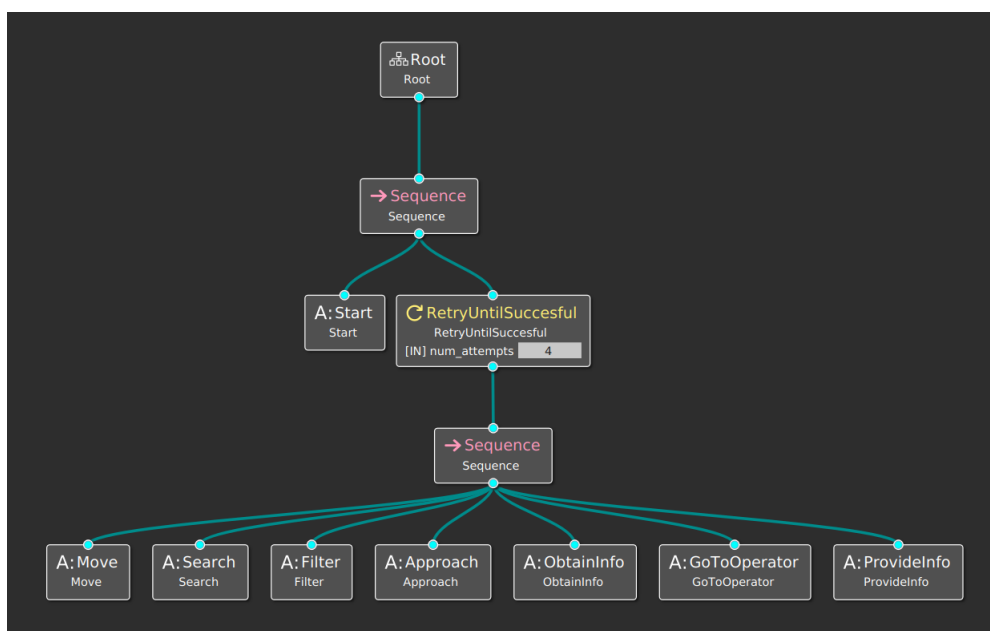
For this task we have used Behavior Trees and Groot

- **Start:** The robot listens the person to say "find my mates". The following actions have 4 attempts to be successful:
- **Move:** The robot moves to the next point in the map.
- **Search:** It revolves around itself searching a person with YOLO. If it's found, the following action will be "Filter", otherwise, the robot will move again.
- **Filter:** Color filter of the shirt of the person.
- **Approach:** Extraction of the middle point of the person from point-cloud and approach with navigation to that point.
- **ObtainInfo:** The robot asks for the name of the person and listen.
- **GoToOperator:** Navigation to operator position.
- **ProvideInfo:** The robot says the name of the person which has found and it's shirt color.

Task 3: Recepcionist
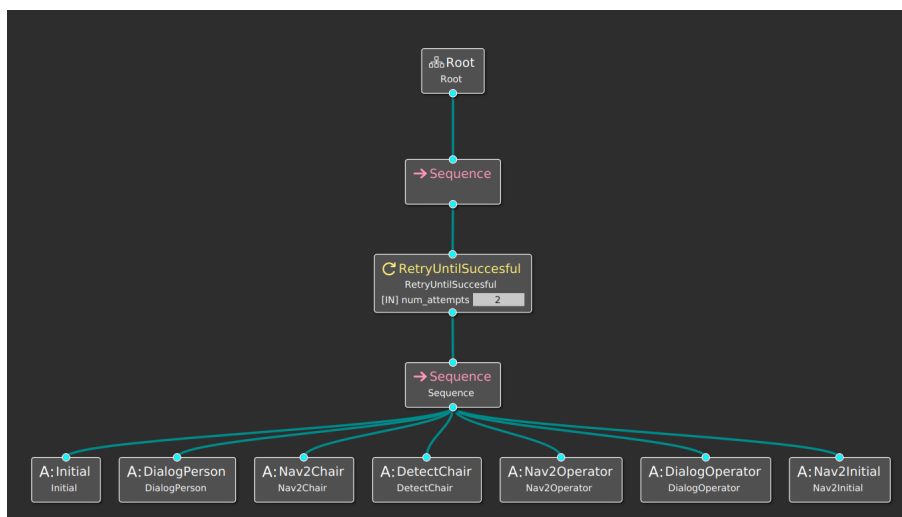
We have used Behavior Trees and Groot in this task as same as task 2. The following sequence will be repeated twice (two people received in the hotel).

- **Initial:** The robot will wait until detects a person using the bounding boxes of YOLO.
- **Dialog person:** The robot will start a conversation with the person, asking his name. Once the robot will have the name, will ask for the favourite drink. The conversation will end with the robot saying follow me.
- **Nav2Chair:** The robot will navigate to the chairs zone.
- **Detect chair:** The robo will turn until finds the chairs, specifically one empty chair. To do this, we have used YOLO to be able to detect where the people and the chairs are and see which one is empty. Once found, the robot will center the chair and draw a green rectangle and a red point on the screen, showing to the person the chair that can use to sit.

– **Nav2Operator:** The robot will go to a table next to the chairs.
– **Dialog operator:** The robot offers the favourite drink to the person who has received before referring to the person with him/her name.
– **Nav2Initial:** Navigation to initial position.

Available Materials

– TurtleBot2
– Laptop
– Hub: to connect robot and laptop

Team Members

– Irene Bandera Moreno
– Isabel Cebollada Gracia
– Javier Martínez Madruga
– Noel Jiménez García
– Jonatan Gines Clavero (team mentor)

Fig. 1. TurtleBot2