Queen Mary
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Humans Have an Expectation That Gaze Is Directed Toward Them: ROS Implementation

ECS794U/ECS794P Cognitive Robotics

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INSPIRATION & PAPER DISCUSSION

1. Gaze interpretation via a Bayesian framework

- Humans have a prior expectation that other people's gaze is directed toward them.

- Stronger prior belief in uncertainty.

- **A bias towards head orientation when eye information is uncertain or missing**.

ROS IMPLEMENTATION

How head orientation influences a robot's perception of gaze

Eyes & Head Node

- Python classes for eye direction & head orientation.
- Publishes a Topic of different combinations of head and eye angles as a message.
- Head angles: -30, 0, +30
- Eye angles: -30, -15, 0, +15, +30

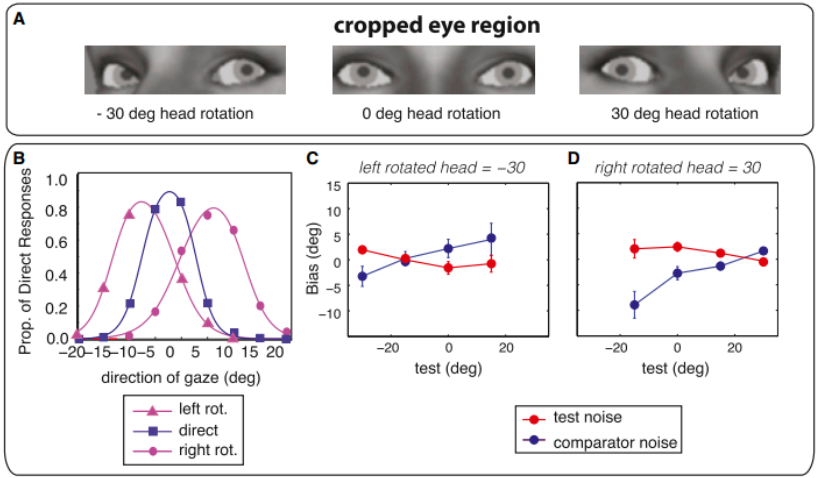


Fig.1: Head orientation experiment

ROS IMPLEMENTATION

How head orientation influences a robot's perception of gaze

Robot Perception Node

- Publishes a Topic of the probability of gaze being perceived as direct or not.
- Subscribes to the Eyes & Head Topic and to the service of the Bayesian Belief Network.

Bayesian Belief Network

- Probability table with combinations of different eye and head angles.
- Discrete values for simplicity.
- Publishes the gaze probability as a service.

ROS IMPLEMENTATION

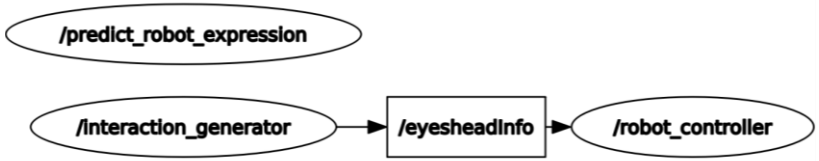
Bayesian Belief Network:

Likelihood of gaze being directed at robot or not depending on head angle.

Eyes angle	Head angle	Eyes probability	Head probability
Eyes -30	Head 0	0.0	1.0
Eyes -30	Head -30	0.1	0.9
Eyes -30	Head +30	0.1	0.9
Eyes -15	Head 0	0.1	0.9
Eyes -15	Head -30	0.0	1.0
Eyes -15	Head +30	0.1	0.9
Eyes 0	Head 0	1.0	0.0
Eyes 0	Head -30	0.8	0.2
Eyes 0	Head +30	0.8	0.2
Eyes +15	Head 0	0.6	0.4
Eyes +15	Head -30	0.1	0.9
Eyes +15	Head +30	0.3	0.7
Eyes +30	Head 0	0.1	0.9
Eyes +30	Head -30	0.0	1.0
Eyes +30	Head +30	0.1	0.9

ROS IMPLEMENTATION

ROS model graph



Results

- Simulation shows that when head is rotated, there is a bias towards head orientation.
- Results are similar to the ones in the referenced paper.

```
maria@maria-VirtualBox:~$ cd catkin_ws/
maria@maria-VirtualBox:~/catkin_ws$ source devel/setup.bash
maria@maria-VirtualBox:~/catkin_ws$ rostopic echo /RobotInfo
looking_straight: 0.300000011921
not_looking_straight: 0.699999988079
---
looking_straight: 1.0
not_looking_straight: 0.0
---
looking_straight: 0.10000000149
not_looking_straight: 0.899999976158
---
```

Output: robot gaze perception. Shows the probability of direct or indirect gaze.