MIRO – A PET ROBOT LEARNING THROUGH INTERACTION

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Background and Objective

- No learning ability in existing pet robots – predefined sets of commands and reactions

- Teaching process contributes to creating bond between humans and animals

- Can be used as a teaching tool or companion robot

- System will allow users to teach robot new commands and reactions

Features

- Actions – set of available simple actions used to build tricks

- Emotion system – emotions and mood used in the learning process

- Command detection – recognition of new and previously known commands

- Learning – modifying probabilities of actions based on feedback

- Sequence building – building complex tricks of several simple actions

- Monitoring system – GUI for controlling the learning process

Performing actions based on probability

1. Generate a random number (N) between 0 and 100

2. For each action in the dictionary:
   - calcucate sum (S) of current action's probability and probabilities of all previous actions
   - if N < S:
      - prepare a message for the current action
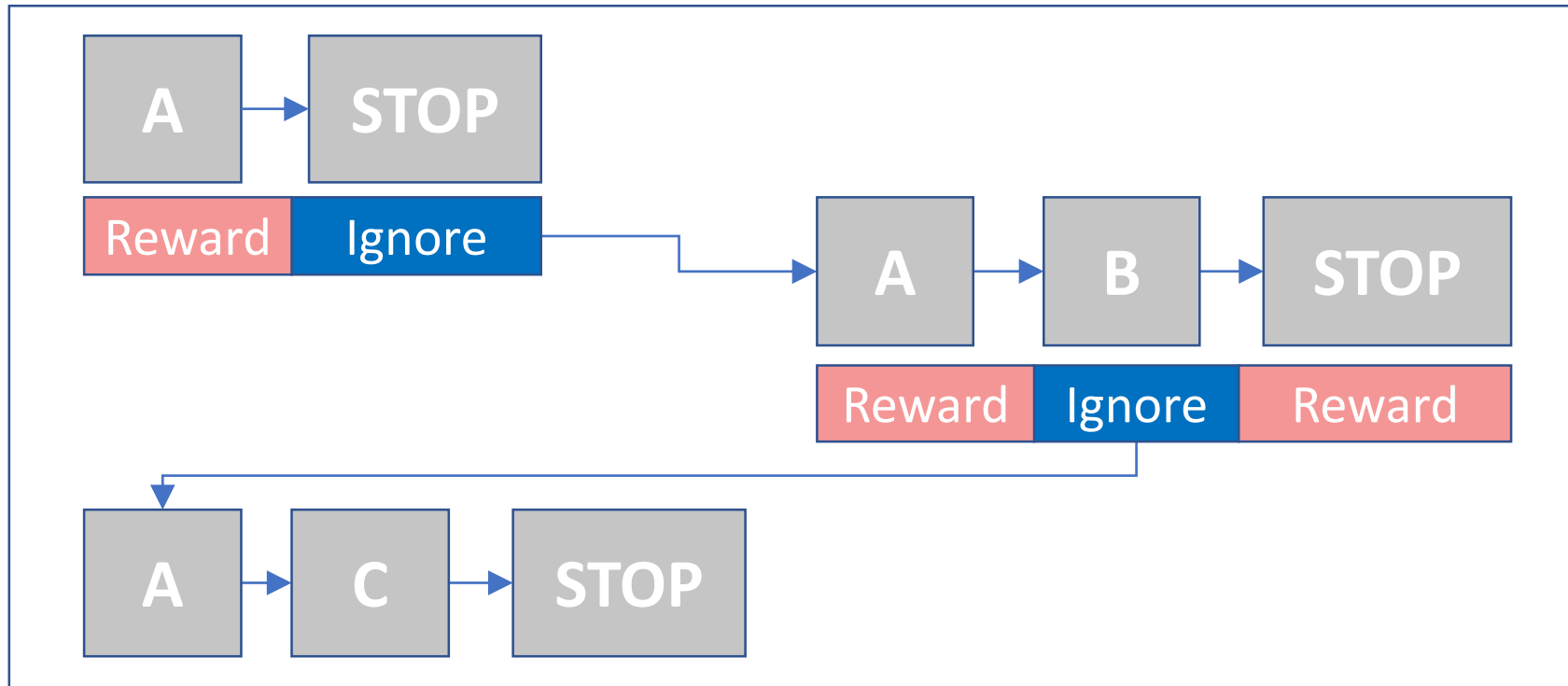   - break

3. Return the prepared message

Command Recognition

1. Transform ROS image into OpenCV image

2. Apply a mask keeping only red, green and blue pixels

3. Find contours of the largest shape in the image

4. Classify the shape into one of the categories based on the contours

5. Check the colour inside the contours against boundaries for red green and blue

Learning – updating probabilities

1. Calculate the sum (S) of learning rate (LR) and probability of chosen action (pA)

2. If S > 100:
- recalculate LR as 100 – pA

3. Calculate rest (R) s sum of all probabilities except for pA

4. Update pA as pA + LR

5. Calculate new rest (nR) like previously

6. Calculate rest ratio (RR) as nR / R

7. For each action (B) in the dictionary:
- if B is not chosen action:
- update probability of B (pB) as pB*RR

Sequence building

QUESTIONS