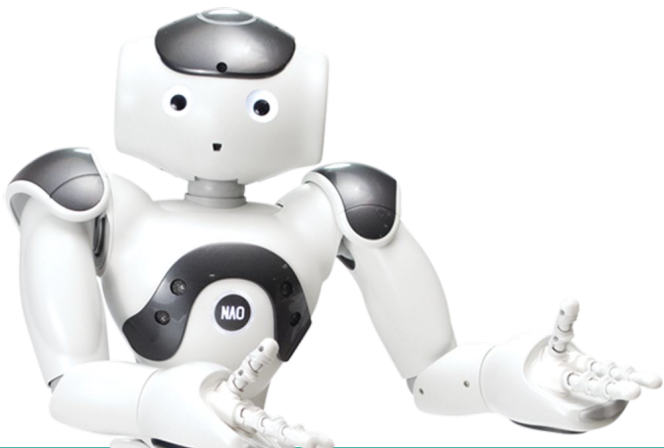

A Turn-Taking Based Number Guessing Game

— Meral Kuyucu
İlknur Çelik —

Preliminaries

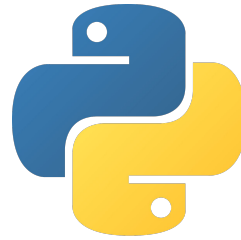
INTRODUCTION

- “Guess the Number” is a human-robot interactive game designed to support the development of mathematical abilities of children in the developmental age.
 - Humanoid NAO Robot
 - Turn-Taking
 - Physical and Verbal Communication

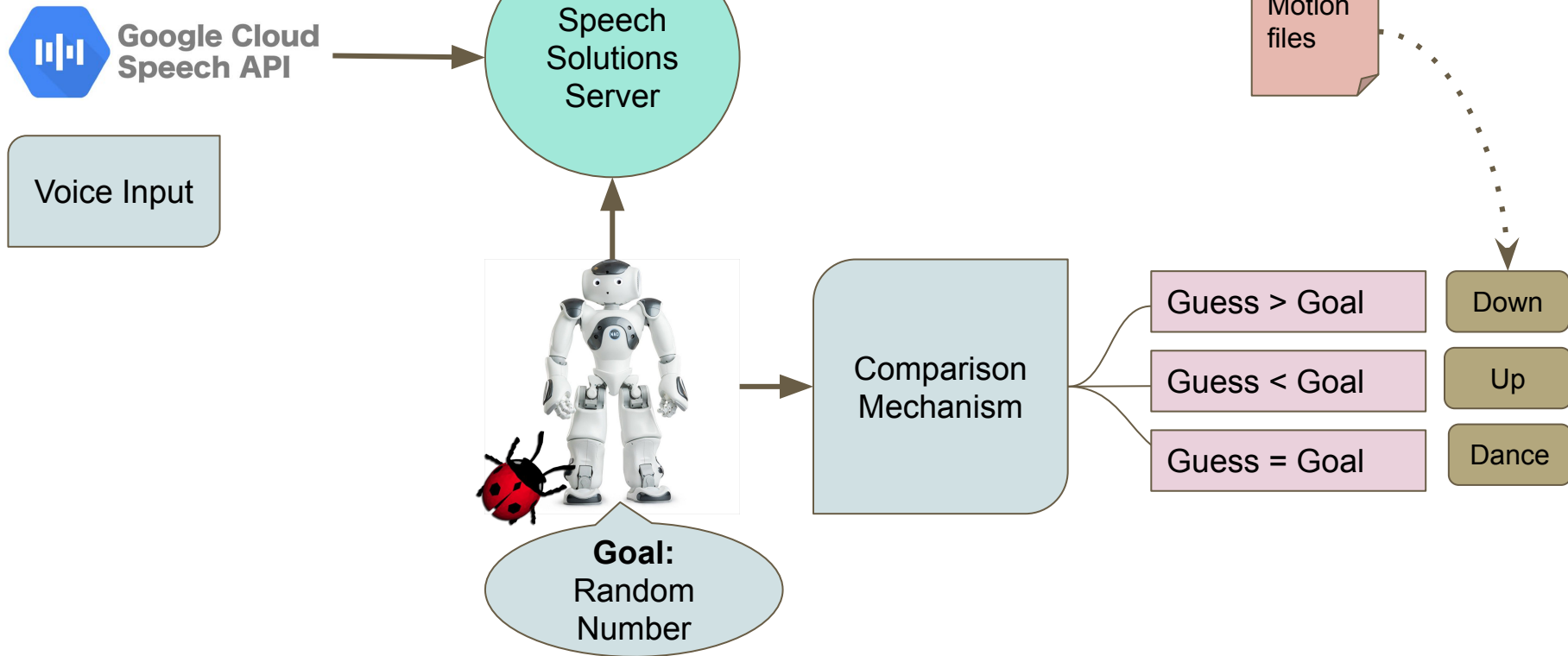


TECHNOLOGIES

- Python
- Webots Simulator
- Google Speech API
- Socket Programming
- Choregraphe



GAME LOOP



Implementation

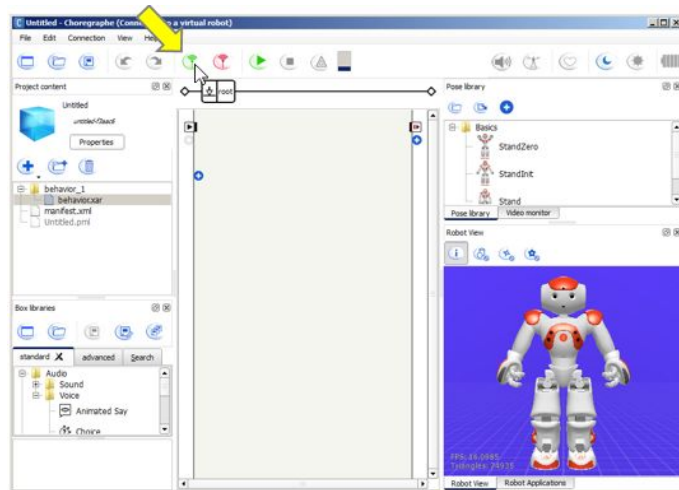
Incorporation of Speech

- Lack of Webots Speech Support
 - Proposed Solution: Speech Processing in the Cloud
 - Google Speech API
- Connect to Common Host
 - Speech to Text
 - Text to Speech



Preparing and Interfacing the Motions

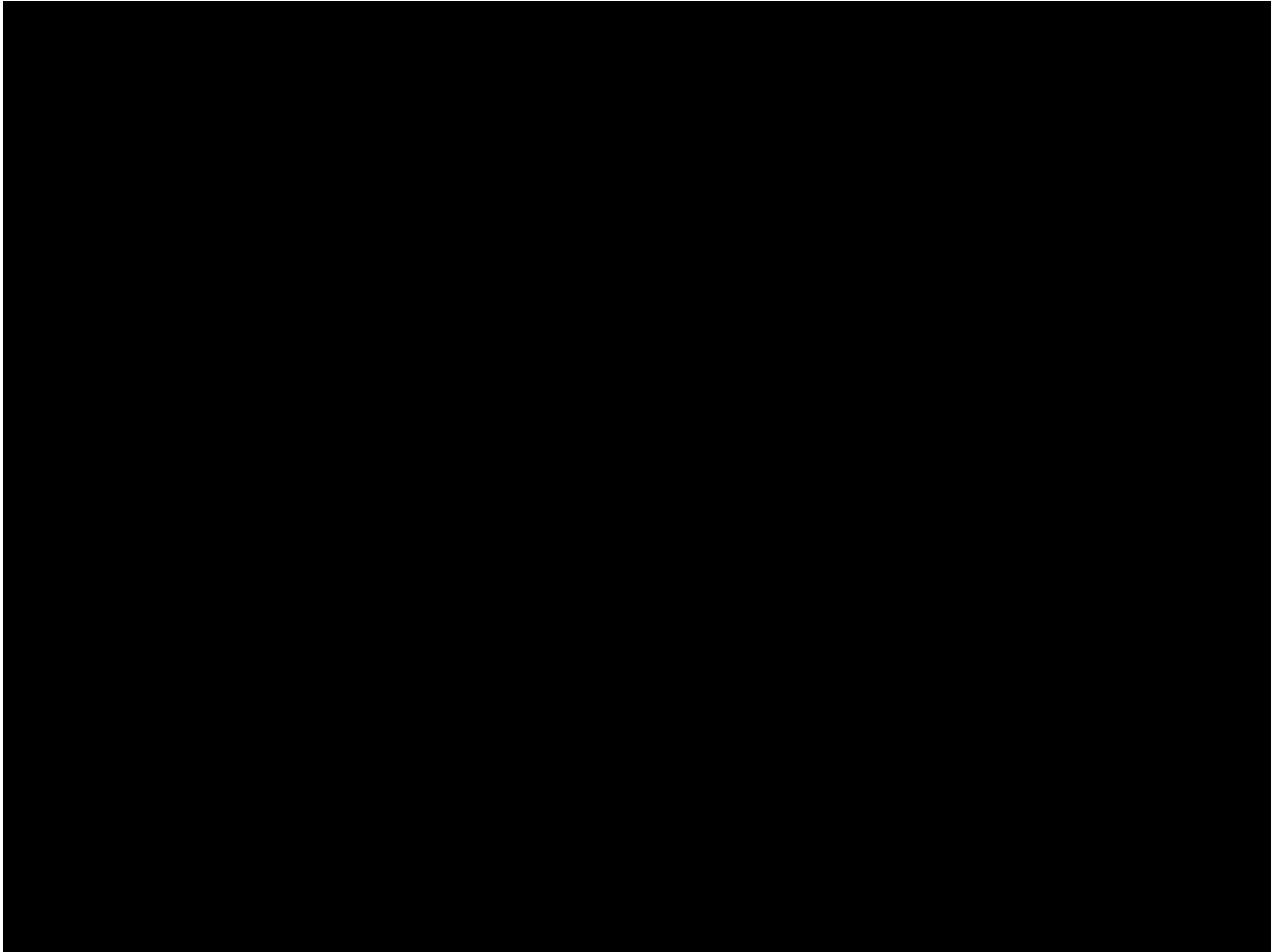
- Motion Extraction via Choregraphe
 - Record Joint Angles at Timestamps
 - Manual Manipulation of Robot Joints
 - Export Python File
 - Times
 - Names
 - Keys
- Webots Motion Files Extracted From Choregraphe Python File
- Motions Performed in Webots Simulator





DEMO





Evaluation and Discussion

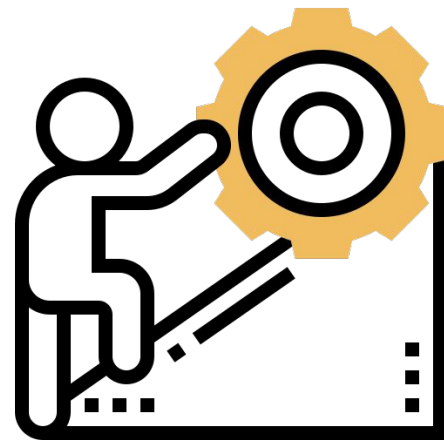
Evaluation in Terms of HRI

- **Physical Proximity:** Proximate Colocated
- **Structure of Group:** Human-Robot Individual Interaction
- **Nature of Task:** Social Oriented / Edutainment Task
- **Duration of Interaction:** Repeated Relatively Long Interaction
- **Information Exchange:** Speech & Gestures
- **Motivation for Interaction:** Spontaneous
- **Autonomy Level:** Peer-to-Peer Collaboration
- **Embodiment:** Anthropomorphic
- **Affordances:** Moving, Socializing



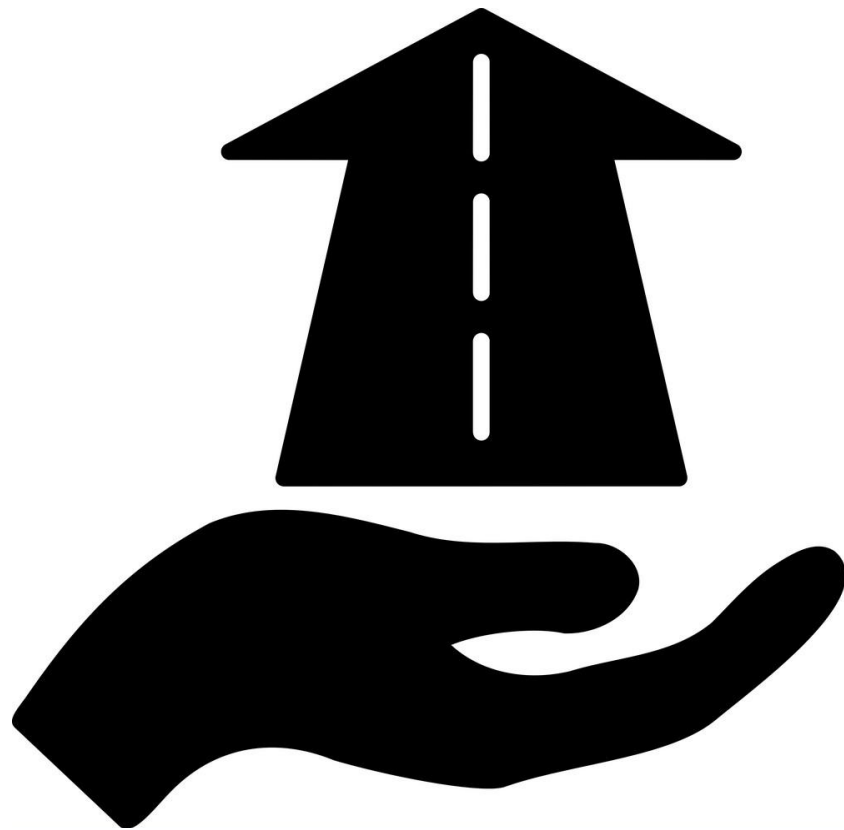
Challenges

- Simulator
 - Operating System
 - No Software Support for M1 Machines
- Speech Recognition
 - Busy Waiting
- Motion Detection
 - Translation of Choregraphe Motion files to Webots Motion Files



Future Work

- Implementation Outside of Simulator
- Fool-Proof Speech Recognition
 - Non-Numerical Inputs
- More Forms of Interaction
 - Visual - Finger
 - Visual - Written Inputs
- Switching Roles in Gameplay
 - Robot Guesses



Conclusions

- Peer-to-Peer Guess the Number Game w/ NAO Robot
- Supports Mathematical Abilities of Children
- Supports Social Skills of Children (Turn-Taking)
- Implemented w/ Python, Webots, and Choregraphe



THANK YOU FOR LISTENING!