Humanoid Robotics Lab

NAO APP DOCUMENTATION

Introduction:

The Nao app provides a convenient interface to control the NAO robot through a web application. The web application has been implemented with the help of React js and the Flask framework of Python. React js acts as the frontend and Flask acts as the backend. Through React js the user can use the interface to control the NAO to do any specific task.

How to start the servers locally:

React - the react app can be started by the ‘npm start’ command at the directory of the src folder.
Flask - the Flask app can be started by the ‘flask run’ command at the directory of the api.py folder.

Communication between frontend and backend:

When the user initiates a task for the Nao, a Post request from React is sent to the Flask framework. It is important to note that the React and the Flask run on their own servers. The proxy for the Flask server is set in the React js package.json. That is, a link to redirect the post request to the flask server is set in the react configuration file, so it knows where to forward such post requests to. The Post request is a way for React to communicate with Flask and has a web api call to the flask server of the format `'http://127.0.0.1:5000/connect'` . Each post request has a specific path in the react server. For example in the given request to connect the application to a NAO with a specific IP and port the path connect is used. And each post request has a set of parameters `const requestOptions = {`

```
    method: 'POST',
```

```
    headers: { 'Content-Type':
'application/json','Access-Control-Allow-Origin': 'http://127.0.0.1:5000'
},
    body: { title: 'React Hooks POST Request for Nao connect',ipAddress:
ipAddr,ipPort:port}
  };
```

As seen in the snippet above,the connect request has the ip address and the port as parameters. Each post request from react is handled in the Flask application. For each path ex: connect, a function connectToNao() is defined which implements the specific task of the user through the naoqi python api.

React Components and Functions:

Components:

1. **CustomDropdown -** Custom Dropdown component that is used to display a set of texts to select from , for the Nao to speak.It can also be used to dynamically add new typed text to the dropdown.

2. **GlassDropdown -** Custom Dropdown component that is used to display a set of Behaviors to select from the group of behavior Glass, for the Nao to speak.It can also be used to dynamically add new typed text to the dropdown

3. **PickDropdown -** Custom Dropdown component that is used to display a set of Behaviors to select from the group of behavior Pick, for the Nao to speak .It can also be used to dynamically add new typed text to the dropdown.

4. **WalterDropdown -** Custom Dropdown component that is used to display a set of Behaviors to select from the group of behavior Walter, for the Nao to speak.It can also be used to dynamically add new typed text to the dropdown

5. **GMFDropdown -** Custom Dropdown component that is used to display a set of Behaviors to select from the group of behavior GMF, for the Nao to

speak.It can also be used to dynamically add new typed text to the dropdown

6. **TextEditor-** Text Editor component that is used as a text area to input the email address in the video tab and text on the say tab.

7. **RotationJoystick-** Rotation Joystick component that is from the previous app and is a wrapper for the movement joystick.

8. **HeadJoystick -** Head Joystick component that implements the head movement of the NAO.

9. **MovementJoystick -** Movement Joystick component that implements the walking of the NAO.

10. **WebApp -** THe WebApp component that implements the entire app and includes all the other components and renders the basic html for the NAO APP.

Functions for Post Requests:

1. **sendPostureReqToFlask -** Function to send a request from React Js to the python Flask Framework for the NAO to perform actions like stand up, wake up,Sit, STand Init and such.
   *Parameter - actionParam -- denotes the action the Nao has to make ex: sit
   Corresponding function in Python - naoActionControl():

2. **sendVolumeReqToFlask -** Function to send a request from React Js to the python Flask Framework for the NAO to change the volume of the Nao's speech
   *Parameter - volumeValue -- denotes the volume value
   Corresponding function in Python - naoVolumeControl():

3. **sendSpeakReqToFlask -** Function to send a request from React Js to the python Flask Framework for the NAO to speak some text
   *Parameter - textString -- denotes the text that Nao has to speak

Corresponding function in Python - naoSpeechControl():

4. **sendSpeakReqToFlask -** Function to send a request from React Js to the python Flask Framework for the NAO to speak some text
   *Parameter - textString -- denotes the text that Nao has to speak
   Corresponding function in Python - naoSpeechControl():

5. **sendConnectReqToFlask -** Function to send a request from React Js to the python Flask Framework for the app to connect to a particular NAO through its Ip Address and Port
   *Parameter - ipAddr -- ip address of the NAO
   *Parameter - port -- PORT OF THE NAO
   Corresponding function in Python - connectToNao():

6. **sendEmailReqToFlask -** Function to send a request from React Js to the python Flask Framework for the app to send
   the email Id to which the app has to send a photo taken by the NAO
   *Parameter - textString -- the email address
   Corresponding function in Python - sendEmailwithPhoto():

7. **sendVideoReqToFlask-** Function to send a request from React Js to the python Flask Framework for the app to take a photo Through the NAO
   *Parameter - textString -- the email address
   Corresponding function in Python - naoVideoControl():

8. **sendBehavReqToFlask-** Function to send a request from React Js to the python Flask Framework for the NAO to implement a behavior
   *Parameter - behavrVal -- the behavior to be implemented
   Corresponding function in Python - naoBehaviorControl():

9. **sendHandMovReqToFlask-** Function to send a request from React Js to the python Flask Framework for the NAO to close or open its hands
   *Parameter - moveVal -- the value which represents to which extent the hand must be open

*Parameter - handVal -- the value which represents which hand of the NAO to control
Corresponding function in Python - naoHandControl():

10. **sendAwarenessReqToFlask-** Function to send a request from React Js to the python Flask Framework for the NAO to implement the basic awareness functionality
Corresponding function in Python - awarenessControl():

11. **sendRotationMovReqToFlask-** Function to send a request from React Js to the python Flask Framework for the NAO to change direction while moving
*Parameter - rotatVal -- the value which represents to which extent the NAO must move
Corresponding function in Python - rotationControl():

12. **sendHeadMovementReqToFlask-** Function to send a request from React Js to the python Flask Framework for the NAO to move its head
*Parameter - xCoord -- NAO Headyaw
*Parameter - yCoord -- NAO Headpitch
Corresponding function in Python - headRotationControl():

Flask Functions:

1. naoActionControl(): - function to implement postures for NAO using the 'ALRobotPosture' proxy from naoqi

Positions implemented: stand up, rest, sit down,wake up,stand zero,stand init, crouch,sit relax. The function receives a post request from react with the parameter for the position to be implemented.

2.naoWalkControl(): -

function to implement walkingfor NAO using the 'ALMotion' proxy from naoqi.The function receives a post request from react with the parameters to be

used for the move function from 'ALMotion' - x coordinate,y coordinate and direction.

3.naoStop()- function to implement stopping the walk of NAO using the 'ALMotion' proxy from naoqi.The function receives a post request from react with the parameters to be used for the move function from 'ALMotion' - x coordinate,y coordinate and direction which are all set to zero.

4.naoVolumeControl(): -

function to implement volume control of NAO using the 'ALAudioDevice' proxy from naoqi.The function receives a post request from react with the parameters to be used for volume control- volume value.

5.naoSpeechControl(): - function to make NAO speak some text using the 'ALTextToSpeech' proxy from naoqi.The function receives a post request from react with the parameters to be used for the speech function - text to be spoken.

6.naoVideoControl(): - function to make NAO speak some text using the 'ALTextToSpeech' proxy from naoqi.The function receives a post request from react with the parameters to be used for the speech function - text to be spoken.

7.naoBehaviorControl(): -

function to make NAO implement custom behaviors created and uploaded to the nao using the choregraphe application. The behaviors are called using the "ALBehaviorManager" proxy from naoqi.The function receives a post request from react with the parameters to be used for the speech function - name of the behaviors as uploaded to NAO.

8.naoHandControl(): -

function to make NAO implement hand closing and opening.using the "ALMotion" proxy from naoqi.The function receives a post request from react with the parameters to be used for hand control - with value 0 when the hand has to be closed and 100 when the hand is open completely.

9.awarenessControl():

function to make NAO implement hand closing and opening.using the "ALMotion" proxy from naoqi.The function receives a post request from react with the parameters to be used for hand control - with value 0 when the hand has to be closed and 100 when the hand is open completely.

10.rotationControl():

function to make NAO implement turning to a specific direction while walking using the ALMotion proxy from naoqi and the move toward function with x coordinate and y coordinate as 0.The function receives a post request from react with the parameters to be used for angle through which the robot has to be rotated- with value 0 when the hand has to be closed and 100 when the hand is open completely.

11.headRotationControl():

function to make NAO implement turning its head to a specific direction using the ALMotion proxy from naoqi and the setAngles for Head function with x coordinate and y coordinate as Headyaw and HeadPitch.The function receives a post request from react with the parameters to be used for angle through which the robots head has to be rotated- Headyaw and HeadPitch.

12.sendEmailwithPhoto():

function to make NAO send an email with a recent photo that the nao has taken using the smtplib,ssl and email libraries . The function receives a post request from react with the parameters to be used for sending the email- email address.

13.connectToNao():

function to make the flask app connect to a nao robot with a particular IP and Port. The function receives a post request from react with the parameters to be used for connecting - IP address and port.