

Session - 01

Problem:

Give a PEAS description of the task environment for each of the following activities. Include detailed write-up on each aspect of the task environment:

- (a) SSN wants to develop and deploy a face-recognition based smart attendance system for its employees and students. Provide a detailed PEAS description for the same.
- (b) SSN wants to develop and deploy an online autonomous proctoring system that can monitor n students through a video communication channel. Provide a detailed PEAS description for the same.
- (c) SSN wants to develop a team of robotic agents to participate in Robocup soccer competition (<https://2021.robocup.org/>). Provide a detailed PEAS description for such a robotic agent.

Solution:

- (a) SSN wants to develop and deploy a face-recognition based smart attendance system for its employees and students. Provide a detailed PEAS description for the same.

a. Performance Index:

- i. **Percentage of accuracy:** Ability to measure the accuracy of identifying and matching the face from database, despite distorted environment.
- ii. **Sloppiness misses:** Ability to differentiate from other face-like objects such as photos. If it recognizes other objects, it would negatively affect our motive.
- iii. **Fuzziness:** Ability to identify a face distinctly from a poor video feed.
- iv. **Robustness:** Ability to recognise multiple faces.

b. Environment:

- i. **Students:** Intended user to log their attendance for classes.
- ii. **Employees:** Intended user to log their attendance for work.
- iii. **College surroundings:** Background noise of video feed from college surroundings' activity.

c. Actuator:

- i. **Sanction message:** Message the user of the system, if attendance is successfully logged or not.
- ii. **Log the attendance:** Store in a persistent data store for auditing, archival and other purposes.
- iii. **Video analysing software:** To separate the face in each video frame from the background surrounding noise

d. Sensor:

- i. **Video camera feed:** To load video feed to obtain picture frames
- ii. **Facial feature recogniser:** To demarcate the facial features like eyes, nose, chin and forehead to obtain a rough sense of the face to analysed.
- iii. **Thermal sensor:** To differentiate face-like objects in the form pictures from human faces

(b) SSN wants to develop and deploy an online autonomous proctoring system that can monitor n students through a video communication channel. Provide a detailed PEAS description for the same.

a. Performance Index:

- i. **Percentage of accuracy:** Measure to differentiate voice prompts from background noises like fan, mouse clicks, etc and differentiate eye movements away from focus of camera
- ii. **Number of malpractice warnings issued:** The more the warnings issued, the better the system can recognise actions on the environments.
- iii. **Data stored:** Amount of data collected from malpractice related feeds.

b. Environment:

- i. **Student:** The intended user of the system who undertakes the exam using the system
- ii. **Home:** The surrounding/background of the intended user, student.
- iii. **Exam related gadgets:** Calculator, paper, rough sheets to workout problems during the exam.

c. Actuator:

- i. **Sanction warning:** Warn the user of any identified malpractice.
- ii. **Log any malpractice:** Back up in persistent data store away from live feed for proof of context.
- iii. **Deny access:** In case of serious malpractice, system should remove access to the exam taker and report immediately.

d. Sensor:

- i. Video camera feed:** To analyse the actions of the student taking the exam and to track eye movement.
- ii. Microphone:** To listen to audio feed to recognise prompting of answers.
- iii. Screen share feed:** To avoid sharing of screen to help other exam takers.
- iv. Geo location:** To avoid the malpractice of two exam takers taking the exam from the same location.

(c) SSN wants to develop a team of robotic agents to participate in Robocup soccer competition (<https://2021.robotcup.org/>). Provide a detailed PEAS description for such a robotic agent.

a. Performance Measure:

- i. Number of goals scored:** The greater number of goals scored indicates that the agent is able to successfully accomplish the stipulated task of winning.
- ii. Percentage of possession of ball:** The greater the ability to possess the ball, the greater would the likelihood of scoring goal, on our path to win the game.
- iii. Percentage of passes completed:** The ability to pass successfully would indicate the ball control ability of the robotic agent to keep hold of possession.
- iv. Number of fouls committed:** Foul commitment would negatively impact our motive of winning by hurting our chances of goal scoring and ball possession.
- v. Number of successful tackles:** Ability of the robots to steal the ball from opponent robots.

b. Environment:

- i. Soccer Ball:** Object to be moved into the goal posts
- ii. Team mate robots:** Co-playing robots with a similar motive to win the game for the team.
- iii. Opponent team robots:** Enemy robots that disturb the play of the robotic agents.
- iv. Soccer field:** The terrain, surrounding structures and demarcation of half-line, d-box and goal posts.
- v. Referee:** Regulator of the game
- vi. Audience:** Stand-by observers

c. Actuator:

- i. Robotic body:** To run in a direction to gain control of the ball, without committing a foul and move towards the intended target of goal posts to score a goal.
- ii. Robotic legs:** Robotic ability to kick the ball in the correct direction and apply a calculated power for the ball to get past the obstacle, like goal keeper.
- iii. Accelerator to run fast:** Motor to increase the speed of the
- iv. Smart Software:** To control the actions of the robotic agent to make smart moves to score a goal.

d. Sensor:

- i. Camera to view environment:** Camera to view the ball's exact location and view the goal post to move in the correct direction.
- ii. Obstacle infrared detector:** Detect the opponents coming in the way to steal the ball via infrared sensor.
- iii. Locator of robots:** Location of team mate robots and opponent robots to predict direction of movement.