Pact Analysis

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1 Introduction

The interactive learning system engages young students and teachers in a quiz-based activity using TUIO devices. The child selects answers by rotating a TUIO to point toward one of four options, receiving immediate visual feedback with a background image change indicating answer choice. Upon a correct answer, a score is recorded, and the child proceeds to the next question. The system tracks each student's progress, allowing teachers to view scores and answer histories by logging in with a TUIO and Bluetooth-enabled device. The teacher can monitor student performance to adapt teaching strategies based on individual progress.

Category	**Description**
People	• **Age Group**: Primarily young children (6–10 years old) and teachers overseeing their progress. • **Persona**: – **Student**: Engages with interactive quizzes, using TUIOs to select answers and receiving immediate feedback. – **Teacher**: Monitors multiple students, reviews individual progress, and provides guidance. Uses a TUIO to access student data and verify answers.

Category	Description
Activities	• **Student**: – Rotates TUIO to choose answers for each question from four options. – Receives feedback based on answer choice (background image change). – Proceeds to the next question after scoring correctly. – Can exit to login screen. • **Teacher**: – Logs in to access and monitor student progress. – Uses TUIO to check students' past answered questions and performance. – Tracks score history and question accuracy.
Context	• **Setting**: Primarily used in classrooms or interactive learning labs. • **Usage Frequency**: Daily or weekly, depending on lesson plans and teacher requirements. • **Environment**: Interactive, requiring focus from both students and teachers. The system adapts to individual student progress. • **Constraints**: – Simple interface suited for young children. – Data privacy considerations for tracking and storing student progress.

Category	Description
Technology	• **TUIO Input Device**: Used by both students (to select answers) and teachers (to check progress). • **Visual Feedback System**: Indicates correct or incorrect answers by changing the background image of answer choices. • **Bluetooth Connectivity**: Enables teacher's device to access and sync with students' progress data. • **Score Tracking and Storage**: Tracks student responses and scores for each question. • **MediaPipe** for Gesture Navigation: Allows students and teachers to navigate through the interface using hand gestures, making the interaction more intuitive and accessible.

Table 1: PACT Analysis for Interactive Learning Project

2 Scenarios

2.1 Student Registers Using a Random TUIO and Chooses Bluetooth Device

The student, Ahmed, arrives at the interactive learning station to begin the quiz session.

1. Ahmed picks up a random TUIO object that's reserved for registration, ensuring it doesn't match any navigation TUIOs.
2. He places the TUIO on the registration area displayed on the screen. The area highlights with an indicator once it detects the TUIO.
3. The system recognizes and assigns the TUIO to Ahmed, linking it to his profile. The screen updates to a new screen to choose his device.
4. The system prompts Ahmed to choose his Bluetooth device for the session. A list of nearby devices appears on the screen, each mapped to a direction.
5. Ahmed rotates the TUIO until he chooses his desired Bluetooth device from the list. Each rotation highlights a different device.
6. Once he points to the correct device, Ahmed confirms his selection by holding the TUIO steady for a few seconds.

7. The interface then transitions to the first quiz question, prompting Ahmed to proceed with the quiz.

2.2 Student Rotates TUIO to Select an Answer

Ahmed begins his first quiz question displayed on the interactive screen.

1. The question appears on the screen, along with four answer options arranged in 4 quarters of the screen.
2. Ahmed picks up the TUIO designated for answer selection and shows it to the camera.
3. Ahmed rotates the TUIO, watching as an arrow on the screen moves to point toward each answer option as he turns the object.
4. As the arrow points to an option, the background of the selected answer square changes, giving visual feedback on which answer he's currently choosing and what it refers to.
5. After considering his choice, Ahmed rotates the TUIO until the arrow points to his selected answer.
6. He holds the TUIO steady and brings the navigation TUIO closer to it indicating his final choice.
7. The system detects this gesture and locks in his answer, briefly displaying a confirmation message, "Correct Answer"
8. Ahmed proceeds to the next stage in the quiz after correctly answering the first question.

2.3 Student Uses "OK" Gesture to Confirm Answer Selection

Ahmed is completing a quiz question and has rotated the TUIO to point to his chosen answer.

1. After choosing his answer by pointing the TUIO's arrow to one of the options, Ahmed shows his other hand from for the gesture-based confirmation.
2. Ahmed raises his hand in front of the screen and makes an "OK" gesture (thumb and index finger forming a circle, other fingers extended).
3. Using MediaPipe, the system detects and recognizes the "OK" gesture from Ahmed's hand.
4. The screen responds immediately with a message: "Answer confirmed!" and the screen changes to a message according to the correctness of the answer

5. Ahmed's score updates to reflect the outcome of his choice, providing feedback.

6. The system then proceeds to the next question allowing Ahmed to begin the process again for the following question.

7. Ahmed continues through the quiz, confirming each answer using the "OK" gesture for a seamless, touch-free experience.

2.4 Teacher Checks Dashboard for Student Attendance and Scores

The teacher, Ms. Sarah, wants to review her students' attendance and quiz scores to track their progress.

1. Ms. Sarah picks up the TUIO assigned to teacher functions and places it in-front of the camera.

2. The system recognizes the TUIO as a teacher's access tool and displays the teacher dashboard, listing a table with student information"

3. A detailed attendance list appears, showing which students have registered and completed quizzes during the session.

4. Ms. Sarah can see an overview of each student's progress, allowing her to identify students who may need extra help or review.

5. Ms. Sarah completes her review and removes the TUIO from the screen, which automatically logs her out of the dashboard to ensure student privacy.

6. The screen returns to the home menu, ready for the next teacher or student interaction.