Weekly Diary of Six-Month Industrial Training

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Week 1: 22 Jan – 28 Jan

Focus: Initial Familiarization with Sensors and Project Objectives

- Introduced to the core concept of gesture-controlled prosthetic systems.
- Understood the training workflow and the significance of gesture recognition in real-world applications.
- Studied the specifications and interfacing techniques for MPU6886 (accelerometer) and SW18015P (vibration sensor).
- Set up Arduino IDE for sensor data acquisition and installed required libraries.
- Collected initial data and visualized sensor outputs using the Serial Plotter and Serial Monitor.
- Understood the importance of data filtering, calibration, and noise reduction for improving sensor accuracy.

Week 2: 29 Jan – 4 Feb

Focus: Implementing Gesture Recording with Arduino

- Designed logic in Arduino to record gestures triggered by movement or button input.
- Implemented a voting-based classification method to identify dominant gestures.
- Encountered issues with continuous recording due to sensor noise; added delay and smoothing techniques.
- Tuned parameters to recognize simple static and dynamic gestures more reliably.
- Started maintaining logs of gesture trials for future comparison and training.

Week 3: 5 Feb – 11 Feb

Focus: Refinement of Hardware Gesture Recognition

- Expanded gesture library to include more complex hand patterns.
- Systematically documented gesture outputs to build a consistent reference dataset.
- Conducted multiple trials to identify reproducible gesture movements.

- Used Excel and graphs to visually analyze signal consistency across repetitions.
- Finalized a set of 5 consistent gestures suitable for transitioning into software modeling.

Week 4: 12 Feb – 18 Feb

Focus: Transition to Software-Oriented Gesture Detection

- Explored Google MediaPipe framework and OpenCV in Python for vision-based tracking.
- Installed required packages and successfully ran sample hand tracking demos.
- Studied how MediaPipe identifies 21 hand landmarks per frame and how to calculate relative positions.
- Began experimenting with single-finger gesture tracking to simulate directional movement.
- Compared performance and complexity of sensor-based vs. vision-based approaches.

Week 5: 19 Feb – 25 Feb

Focus: Planning the Virtual Keyboard Project

- Decided on a software-only project for college submission to avoid hardware deployment issues.
- Designed the UI layout for a virtual keyboard using OpenCV with keys drawn on screen.
- Created mouse pointer simulation using finger tip coordinates.
- Defined interaction logic for a pinch gesture to simulate "click" or "keypress".
- Started working on mapping each keyboard zone to a screen region using bounding boxes.

Week 6: 26 Feb – 3 Mar

Focus: Pinch Gesture Detection and Key Mapping

- Programmed a pinch detection algorithm based on the distance between thumb and index finger.
- Created functions to highlight a key when hovered and to simulate pressing it when pinched.
- Implemented key mapping for alphabets and spacebar.
- Integrated pynput to send key inputs to the system in real-time.

- Began testing responsiveness of the virtual keyboard under different lighting conditions.

Week 7: 4 Mar – 10 Mar

Focus: Adding Core Functionalities to Virtual Keyboard

- Added support for case toggling (upper/lower) through gesture-based control.
- Programmed gestures for space, clear (delete), and special functions.
- Adjusted pinch sensitivity and added debounce time to avoid multiple inputs.
- Ran user trials to validate ease of gesture execution and system feedback.
- Started noting down challenges with gesture overlap and hand movement stability.

Week 8: 11 Mar – 17 Mar

Focus: Optimization and Modularization of Code

- Restructured the code into modular files for better readability and maintenance.
- Optimized frame capture and processing to ensure real-time response.
- Improved accuracy by refining gesture distance thresholds dynamically based on screen size.
- Added error-handling blocks for webcam disconnection or hand loss scenarios.
- Logged performance metrics such as frame rate and latency during typing simulation.

Week 9: 18 Mar – 24 Mar

Focus: User Interface Enhancements and Accuracy Improvement

- Redesigned UI for better visibility of keyboard keys and fingertip positions.
- Smoothed transitions when highlighting and selecting keys.
- Incorporated visual feedback (color changes, border highlights) during gestures.
- Tested system for false positives and minimized unintentional key presses.
- Documented gesture-to-function mappings with illustrations.

Week 10: 25 Mar – 31 Mar

Focus: Documentation and Media Capture

- Captured real-time screenshots showing gesture detection and keypress output.

- Designed a visual architecture diagram of the system workflow.
- Started writing project sections including introduction, methodology, and system design.
- Compiled experimental results, gesture library, and performance summary.

Week 11: 1 Apr – 7 Apr

Focus: Drafting Reports and Theory Documentation

- Drafted daily diary summaries and technical documentation.
- Wrote sections like problem statement, objectives, tools and technologies used.
- Linked each stage of the project to a corresponding training outcome.
- Prepared image annotations and added captioned screenshots to documents.

Week 12: 8 Apr – 14 Apr

Focus: Peer Review and Mid-File Finalization

- Shared documents with peers and mentors for review.
- Incorporated suggestions on content flow, grammar, and alignment with learning goals.
- Finalized the mid-report document as per college submission format.
- Adjusted content to fit word limits while maintaining technical accuracy.

Week 13: 15 Apr – 21 Apr

Focus: Completing Mid Submission and Alignment

- Conducted one final verification of code snippets and theory alignment.
- Took additional screenshots to replace blurred ones in the report.
- Added a table of contents, references, and formatting consistency to the file.

Week 14: 22 Apr – 28 Apr

Focus: Final Polishing of the Project

- Performed a complete run-through of the virtual keyboard project.
- Fixed minor glitches related to lighting and tracking delay.
- Verified that the system met all initially proposed objectives.

- Updated UI for smoother experience and added background elements.

Week 15: 29 Apr – 5 May

Focus: Final Report and Viva Preparation

- Assembled the final project report with concluding insights and future work.
- Documented system limitations and suggestions for improved tracking.
- Prepared a question bank for viva and created a PowerPoint presentation.

Week 16: 6 May – 12 May

Focus: Final Review and File Packaging

- Cross-verified all components: daily diary, mid-report, final file, and project outputs.
- Printed reports, checked formatting, and verified screenshots and diagrams.
- Compiled all materials into a submission-ready package.
- Submitted soft and hard copies and prepared for final presentation.