Project Plan

Name: DXZB7

Project Title: Diffusion Models for Novel Motion Generation

Supervisor's Name: Yuzuko Nakamura

Aims and Objectives

Aims: - Investigate the application of diffusion models for generating realistic and novel motions based on input motion sequences.

Objectives:

- **Literature Review:**
  - Conduct an in-depth review of diffusion models, motion generation techniques, and relevant works in the field.
  - Identify key challenges and opportunities in utilizing diffusion models for motion generation.
  - Explore existing research on reducing irregularities, particularly in foot contact consistency, in generated motions.
- **Data Preprocessing and Model Design:**
  - Analyze and preprocess the given motion sequence data into a suitable format for diffusion model investigation.
  - Design a diffusion model for motion generation, considering factors such as style, speed, and diversity.
  - Investigate and propose methods for improving foot contact consistency and reducing irregularities in generated motions.
- **Implementation of Investigative Framework:**
  - Implement the designed framework for investigating diffusion models in motion generation.
  - Conduct initial experiments and adjustments based on preliminary findings.
  - Establish a methodology for evaluating the effectiveness of the proposed irregularity reduction techniques.
- **Experiments and Analysis:**
  - Execute experiments using the diffusion model and the proposed irregularity reduction techniques.
  - Analyze the results, considering factors such as motion realism, diversity, and irregularity reduction.
  - Iteratively refine the investigative framework based on experimental outcomes.
- **Documentation and Paper Writing:**
  - Document the entire research process, including methodology, experimental setup, and results.

- Draft the research paper, including literature review, methodology, findings, and discussion.
- Revise and finalize the paper for submission to a peer-reviewed conference or journal.

Expected Outcomes/Deliverables

- **Reports and Documentation:**
  - Comprehensive literature survey on diffusion models in motion generation.
  - Documented investigative framework for diffusion model evaluation.
  - Research paper detailing the investigation, methodology, and findings.
  - Detailed documentation on proposed irregularity reduction techniques.
- **MoSCoW Requirements List:**
  - **Must-Have:**
    - Comprehensive literature survey on diffusion models.
    - Documented investigative framework for diffusion model evaluation.
    - Research paper detailing investigation and findings.
  - **Should-Have:**
    - Fully implemented diffusion model for motion generation.
    - Experimental results demonstrating effectiveness.
    - Analysis of irregularity reduction techniques.
  - **Could-Have:**
    - Integration with external motion capture data sources.
    - Real-time motion generation capabilities.
  - **Won't-Have:**
    - Integration with virtual reality or augmented reality platforms.

Work Plan

- **Project Start to End of October:**
  - Literature review on diffusion models and motion generation techniques.
  - Define initial project requirements and constraints.
- **Mid-October to Mid-November:**
  - Refine project requirements based on literature findings.
  - Develop a detailed investigative framework for diffusion model evaluation.
  - Conduct a risk analysis and identify potential project challenges.
- **November to Mid-January:**
  - Implement the investigative framework and conduct initial experiments.
  - Analyze preliminary results and make necessary adjustments.
  - Establish a robust methodology for evaluating irregularity reduction techniques.
- **Mid-January to Mid-March:**
  - Conduct experiments using the diffusion model and proposed irregularity reduction techniques.

    - Analyze experimental results and iteratively refine the investigative framework.
    - Document findings and prepare the initial draft of the research paper.
- **Mid-March to End of April:**
    - Revise and finalize the research paper based on feedback.
    - Prepare detailed documentation on proposed irregularity reduction techniques.
    - Complete the final research paper and submit it to a peer-reviewed venue.