



ECD 415

PROJECT PHASE 1

FIRST REVIEW

Project Guide

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INTEGRATED IMAGING AND TREATMENT MONITORING SYSTEM FOR DIABETIC FOOT ULCER

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INTRODUCTION

- Diabetic foot ulcers are a common and debilitating complication of diabetes, often leading to amputations and decreased quality of life.
- Timely and effective treatment is crucial for optimal outcomes.
- Our Integrated Imaging and Treatment Monitoring System is a groundbreaking solution that combines advanced imaging technologies with real-time monitoring to revolutionize the diagnosis, treatment, and management of diabetic foot ulcers



OBJECTIVES

- Improve Diagnosis
- Personalized Treatment
- Treatment Monitoring
- Data-Driven Decisions
- Streamline Care
- User-Centric Design



LITERATURE REVIEW

SI No	Authors	Title	Key Inferences
1	Michael A.Del Core,Junho Ahn,Robert B.Lewis Katherine M.Raspovic,Trapper A.J.Lalli and Dane K.Wukich	The Evaluation and Treatment of Diabetic Foot Ulcers and Diabetic Foot Infections	<ol style="list-style-type: none">1) Patient education is vital: Educating patients on proper foot care and management is crucial for preventing complications and promoting overall well-being.2) Comprehensive evaluation is crucial: A detailed history and thorough physical exam are essential for effective management, suggesting that a thorough assessment is necessary to identify potential issues.



LITERATURE REVIEW

SI No:	Authors	Title	Key Inferences
2	Puneeth N. Thotad Geeta R. Bharamagoudar Basavaraj S. Anami	Diabetic foot ulcer detection using deep learning approaches	1)Early detection of diabetic foot ulcers,which is crucial for preventing complications and improving treatment outcomes. 2)Potential for automated detection,which can assist healthcare professionals in diagnosing and treating diabetic foot ulcers more efficiently.



LITERATURE REVIEW

SI No:	Authors	Title	Key Inferences
3	Sujit Kumar Das, Pinki Roy, Prabhishek Singh, Manoj Diwakar, Vijendra Singh, Ankur Maurya, Sandeep Kumar, Seifedine Kadry, and Jungeun Kim	Diabetic Foot Ulcer Identification: A Review	<p>1)Deep learning,machine learning and computer vision can significantly aid in the early diagnosis of Diabetic Foot Ulcers,which is crucial for preventing amputations.</p> <p>2)Enhanced ability to detect early signs of DFU.</p> <p>3)Faster decision making and treatment planning.</p>



EXISTING SYSTEM

- Visual inspections and manual measurements
- Photographic documentation
- Wound scoring systems
- Intermittent monitoring
- Reactive treatment adjustments



DEMERITS OF THE EXISTING SYSTEM

- Subjective and variable assessments
- Limited accuracy and reliability
- Inconsistent documentation and communication
- Delayed detection of complications
- Reactive rather than proactive treatment
- High risk of human error
- Limited patient engagement and education
- Inefficient use of resources and time.



PROPOSED SYSTEM

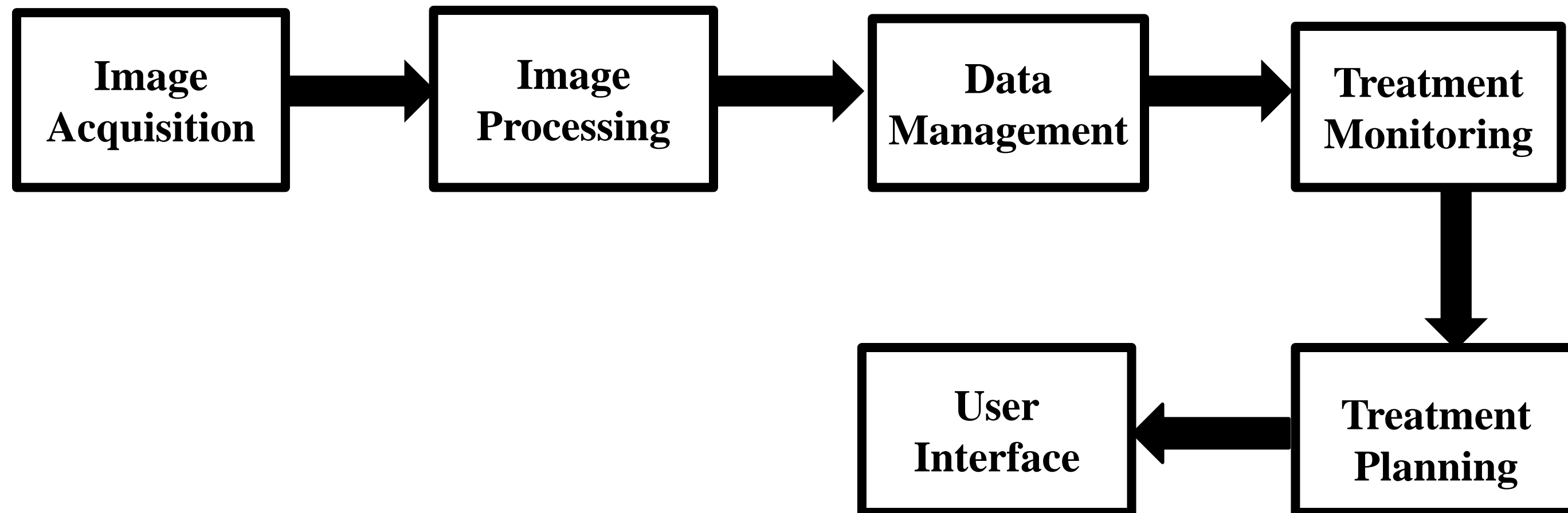
- Advanced Imaging (3D)
- Wound classification
- Patient Monitoring (remote, continuous)
- Personalized Treatment Planning
- Clinical Decision Support
- Secure Data Management (cloud-based, EHR integration)



METHODOLOGY

- Collect patient data and wound images
- Analyze images
- Assess wound severity and progression
- Develop personalized treatment plans
- Monitor wound progression in real-time
- Adjust treatment plans
- Provide clinical decision support and patient engagement
- Evaluate treatment outcomes and refine the system

BLOCK DIAGRAM





1. Patient Data Management

1.1 Patient Registration

- Input: Patient demographics, medical history, contact information
- Processing: Validate input data, generate unique patient ID
- Output: Patient profile created

1.2 Data Entry

- Input: Ulcer characteristics (location, size, depth, stage)
- Processing: Store data in database, update patient profile
- Output: Updated patient profile



2. Imaging Acquisition

2.1 3D Scanning

- Input: 3D scan data from scanner
- Processing: Convert scan data to 3D model
- Output: 3D model of foot ulcer

2.2 Thermal Imaging

- Input: Thermal images from infrared camera
- Processing: Analyze temperature distribution
- Output: Thermal image with temperature mappings



3. Image Analysis

3.1 Wound Segmentation

Input: 3D model, thermal image

Processing: Segment ulcer tissue from surrounding tissue

Output: Segmented ulcer tissue

4. Sensor Data Integration

4.1 Temperature Sensor Data

Input: Temperature readings from sensors

Processing: Analyze temperature trends

Output: Temperature trend analysis



5. Assessment of diabetic foot ulcer

Doctor check the wound size , depth and severity, healing rate of patients diabetic foot ulcer image.

6. Treatment Monitoring and Management

6.1 Treatment Plan Creation

- Input: Patient data, image analysis results
- Processing: Generate personalized treatment plan
- Output: Treatment plan



6.2 Treatment Tracking

- Input: Patient compliance data
- Processing: Track treatment progress
- Output: Treatment progress report

7. Reporting

7.1 Patient Dashboard

- Input: Patient data, image analysis results
- Processing: Generate interactive dashboard
- Output: Patient dashboard



HARDWARE REQUIREMENTS

- Imaging Module:
 - 3D scanning device (e.g., structured light scanner)
 - High-resolution camera
- Sensing Module
 - Temperature sensors



- Moisture sensors
- Pressure sensors (for pressure mapping)
 - The Communication Module
- Wi-Fi or Ethernet connectivity for data transfer
- Bluetooth or NFC for device connectivity (e.g., sensors, mobile devices)
 - Power Supply
 - Mobile Device (for patient engagement)
- Smartphone or tablet with camera and internet connectivity



ALGORITHMS USED

1. Image Capture and Preprocessing

- Algorithm: Image acquisition and preprocessing algorithms (contrast adjustment, noise reduction)

2. Image Segmentation and Analysis

- Algorithm: Convolutional Neural Networks (CNNs), U-Net, or other segmentation models.



3. Feature Extraction and Measurement

- Algorithm: Feature extraction techniques such as edge detection (Canny edge), texture analysis, or shape.

4. Healing Stage Classification

- Algorithm: Machine learning classifiers or deep learning models for image classification.

5. Data Transmission and Integration

- Algorithm: Secure communication protocols like HTTPS or Bluetooth for secure data transfer.



6. Doctor's App for Image Visualization

- Algorithm: UI/UX frameworks and REST APIs for data retrieval.

7. Monitoring and Tracking Wound Healing Over Time

- Algorithm: Time-series analysis or recurrent neural networks (RNNs) if tracking healing progression.



ADVANTAGES

- Early detection and prevention of complications
- Personalized treatment plans
- Improved wound healing rates
- Reduced amputations
- Enhanced patient engagement and education
- Streamlined clinical workflows
- Data-driven decision making
- Better patient outcomes



CONCLUSION

- Early detection & prevention
- Personalized treatment plans
- Improved patient outcomes
- Streamlined clinical workflows
- Enhanced quality of life



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THANK YOU