CO-PILOT ENVIRONMENT ANALYSIS AND GUIDANCE SYSTEM

Presented by

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Introduction

1.Importance

- Developing a computer vision system for the blind is crucial, granting them independence and safety. Through auditory cues from visual data, it helps them navigate, recognize obstacles, read text, and boosts inclusivity, autonomy, and daily life quality, revolutionizing their interaction with the world..

2. Significance

- The computer vision system for the blind is highly significant, providing them with independence, safety, and improved quality of life..

3. Application

- navigation,
- obstacle recognition
- text reading

4. Recent trends

- Recent trends in computer vision for the blind include advancements in deep learning models for object detection, integration of wearable devices with real-time scene analysis, and the development of user-friendly, voice-driven interfaces for seamless interaction and accessibility.
- Example: Apple Vision

Literature Review

Sr. No.	Author Name	Title	Objective	Methodology	Algorithm	preprocessing Techniques	Accuracy / Results
1.	• Aswath Suresh • Debrup Laha • Dhruv Gaba • Chetan Arora	Intelligent Smart Glass for Visually Impaired Using Deep Learning Machine Vision Techniques and Robot Operating System (ROS)	• Enhanced Mobility and Navigation • Object Detection and Recognition • ROS Integration • Obstacle Avoidance and Path Planning • Real-time Feedback • Adaptability to Various Environments • Gesture and Voice Interaction		Using Deep Learning Machine Vision Techniques and Robot Operating System (ROS)		
2.	• Rakesh Chandra Joshi • Saumya Yadav • Malay Kishore Dutta • Carlos M. Travieso-Gonzalez	Efficient Multi-Object Detection and Smart Navigation Using Artificial Intelligence for Visually Impaired People	• Multi-Object Detection • Efficiency and Real-Time Performance • Semantic Segmentation • Smart Navigation Assistance		Automatic quantization algorithm is developed for (DCNN)-based object detection		

3	• Sahar Busaeed • Rashid Mehmood Iyad Katib • Juan M. Corchado	LidSonic for Visually Impaired: Green Machine Learning-Based Assistive Smart Glasses with Smart App and Arduino	• Enhanced Independence • Obstacle Detection • Object Recognition • Text-to-Speech • Navigation Assistance • Customization • Accessibility • Privacy and Security • User Feedback and Improvement	Creating "LidSonic for Visually Impaired" involves developing smart glasses with cameras, sensors, and Arduino devices. Machine learning is used for real-time obstacle detection and object recognition. A mobile app complements the glasses, offering customization and GPS navigation. Text-to-speech technology converts text to audio, ensuring accessibility. Privacy and security are essential, and ongoing improvements are based on user feedback and compliance with regulations. Collaboration with visually impaired individuals and experts is key to creating an effective assistive technology.	• Initialization • Capture Camera Feed • Obstacle Detection • Object Recognition • Text-to-Speech • Navigation • User Interaction • Audio Feedback • Privacy Measures • Continuous Improvement	• Image Preprocessing • Data Augmentation • Sensor Data Processing • Speech Signal Preprocessing • Temporal Filtering • Feature Extraction	• Object Detection and Recognition Accuracy:Aim for an accuracy rate of 90% • Obstacle Detection Accuracy: Strive for a high accuracy rate of at least 95% • Text Recognition Accuracy: Target a recognition accuracy rate of 95% • Navigation Effectiveness: Evaluate the system's ability to 90% • User Feedback and User Experience: Measure high user satisfaction, with a target of 90%

4	• Dawon Kim • Yosoon Choi	Applications of Smart Glasses in Applied Sciences: A Systematic Review	• Comprehensive Overview • Identify Trends • Assess Study • Recommendations • Resource	The systematic review focuses on exploring the applications of smart glasses in applied sciences. It begins with a defined research question and a structured review protocol that outlines criteria for study selection, data extraction, and analysis. Comprehensive literature searches are conducted, and relevant articles are chosen based on predefined criteria. Data from selected studies are extracted, and their quality is assessed.	• Define Research Objectives • Development • Literature Search • Study Selection • Data Extraction • Assessment • Data Synthesis • Results Presentation	• Duplicate Removal • Screening and Selection Criteria • Language and Publication • Data Extraction Template • Quality Assessment Tools • Data Categorization • Data Normalization • Missing Data Handling • Data Coding • Meta-Analysis (if applicable)	Inclusion Criteria Adherence:this should be close to 100% Inter-Rater Agreement:90% Quality Assessment Scores: Completeness of Data: The percentage of studies with complete data on relevant variables or outcomes.
5	• Yongtuo Zhang • Weitao Xu • Wen Hu • Hongkai Wen	NaviGlass: Indoor Localisation Using Smart Glasses	• Precise Indoor Localization: Navigation: • User-Friendly Interface: • Cross-Platform Compatibility: • Robustness and Reliability: • Security: • Scalability • User-Centric Experience: Potential: • Development: • Accessibility:	The methodology focuses on developing a precise indoor localization system for smart glasses. It encompasses designing a user-friendly interface, ensuring cross-platform compatibility, and prioritizing robustness and security. Scalability and user-centric improvements are key, as is exploring integration potential with other applications. Research and development contribute to technology advancement, while accessibility and commercial viability are also addressed.	Sensory Data Collection: Analysis: Sensor Fusion:. Map Data Integration: Position Estimation: Navigation Guidance: User Interaction: Data Privacy and Security: Iterative Improvement: Features: Integration with Other Services:	• Duplicate Removal: • Screening and Selection Criteria: • Language and Publication Date Filtering: • Data Extraction Template: • Quality Assessment Tools: • Data Categorization: • Data Normalization: • Missing Data Handling: • Data Coding: • Meta-Analysis (if	• Positional Accuracy: • Percentage of Correct Position Estimations: • Error Metrics: • Confidence Intervals:

6	Jinqiang Bai, Shiguo Lian, Member, IEEE, Zhaoxiang Liu, Kai Wang, Dijun Liu	Smart Guiding Glasses for Visually Impaired People in Indoor Environment	• Precise Indoor Navigation: • Obstacle Detection and Avoidance: • Enhanced Spatial Awareness: • User-Centric Design: • Indoor Mapping and Localization: • Integration with Assistive Technologies: • Privacy and Security: • Continuous Improvement: • Accessibility Features: • Training and Support: • Real-World Testing:	The methodology for "Smart Guiding Glasses for Visually Impaired People in Indoor Environments" follows a user-centric approach. It begins with a thorough assessment of user needs and preferences, involving visually impaired individuals and experts. The system is designed to integrate sensors, computer vision, and audio feedback for indoor navigation. Accurate indoor mapping, obstacle detection, and navigation algorithms are developed. The user interface prioritizes accessibility and interaction through auditory and haptic feedback.	• Indoor Mapping Algorithm: • Localization Algorithm: • Obstacle Detection Algorithm: • Navigation Algorithm: • Algorithm: • Haptic Feedback Algorithm: • Algorithm: • Algorithm: • Accessibility Features Algorithm: • Continuous Improvement Algorithm: • AI Algorithms:	• Sensor Data Calibration: • Sensor Fusion: • Indoor Mapping Data Processing: • Obstacle Detection Data Filtering: • Localization Data Synchronization: • Audio Feedback Generation: . • Haptic Feedback Generation: . • Privacy Measures: • User Interface Optimization:	• Obstacle Detection Accuracy • Positional Accuracy: • Navigation Accuracy: • User Satisfaction

Research Gap

- Lack models and algorithms to find depth
- help to navigate people through voice assistance
- Not much work on real time
- Less work on action recognition
- Specific integrating system for above operation

Problem Statement

Enhancing Independence and Mobility for the Visually Impaired through Computer Vision-Powered Smart Glasses

Objective

To…

1. Enhanced Navigation in the environment.

2.Audio output of intrepretion.

3. Real-time Output.

Methodology

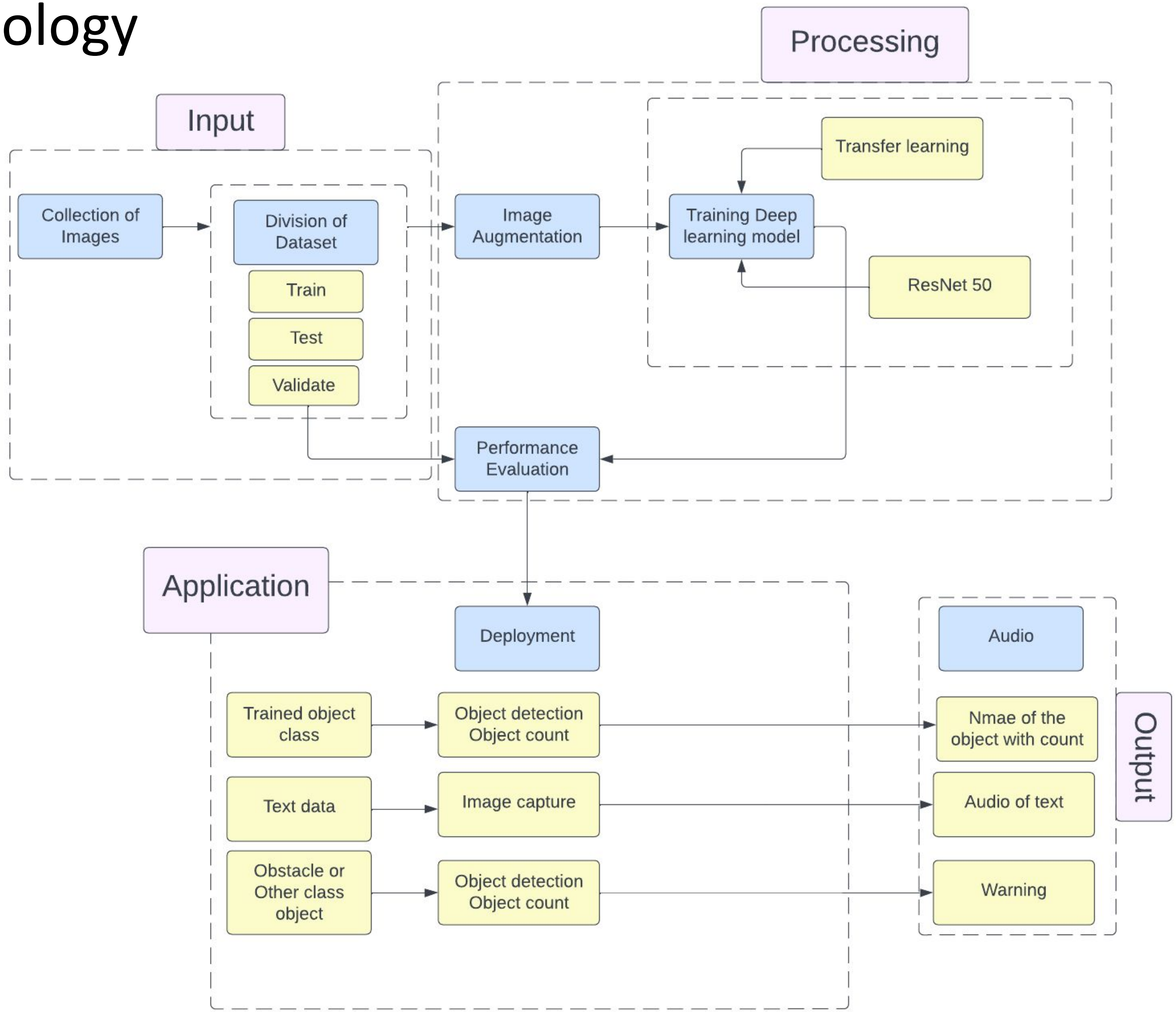


Image Dataset of Mendeley

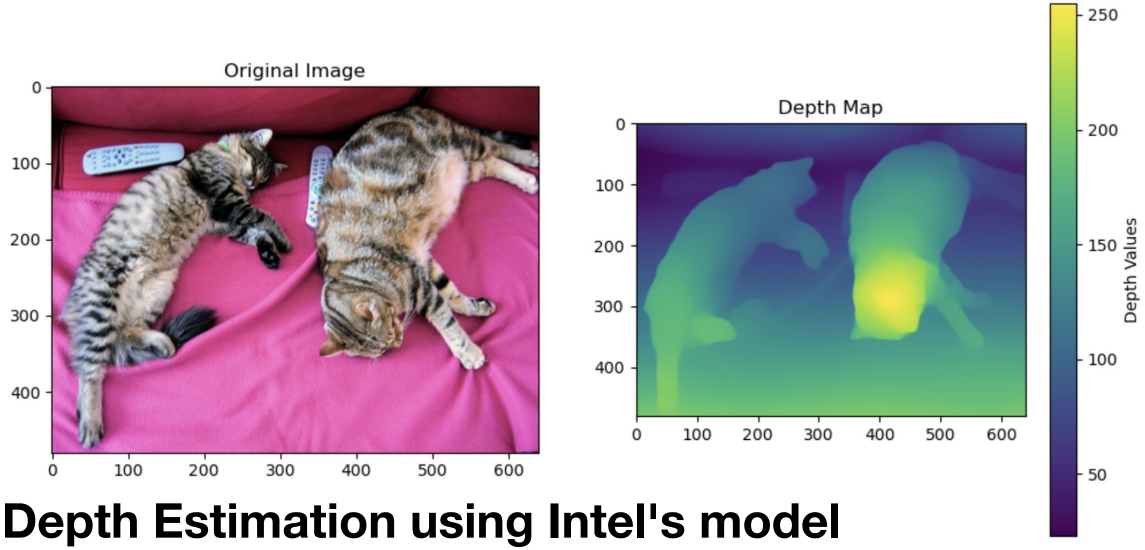
- Published by: Mendeley
- Submitted by: Yingguang Li
- Published on: 24 June 2020
- This Dataset is used for
    - Analyzing the influence of process information on monitoring signals under the same tool wear state through signal processing methods.
    - Training and testing models of tool monitoring and tool wear prediction for cutting conditions and cutting parameters.
- Link: https://data.mendeley.com/datasets/2xkpwx3h59/1

Model Details: DPT-Large

For monocular depth estimation, a Dense Prediction Transformer (DPT) model was trained on 1.4 million pictures. It was initially made available in this repository and presented in the paper Vision Transformers for Dense Prediction by Ranftl et al. (2021). DPT bases monocular depth estimation on the Vision Transformer (ViT) and adds a head and neck on top.

Model Detail	Description
Model Authors - Company	Intel
Date	March 22, 2022
Version	1
Type	Computer Vision - Monocular Depth Estimation
Paper or Other Resources	Vision Transformers for Dense Prediction and GitHub Repo
License	Apache 2.0
Questions or Comments	Community Tab and Intel Developers Discord

Result



Depth Estimation using Intel's model

Depth Estimation on live video

Comparative Distance calculation

Conclusion

- Smart glasses for the blind, equipped with advanced vision sensors and powered by deep learning with transfer learning, provide real-time environmental awareness and object recognition.
- They offer immediate audio feedback, enhancing mobility and independence