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DESIGN AND DEVELOPMENT OF EXAM KIT FOR CHILDREN WITH DYSGRAPHIA DISORDER

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ABSTRACT

Dysgraphia is a learning disorder that affects handwriting abilities, making it difficult for children to express ideas effectively through writing. This paper presents the design and development of an assistive exam kit aimed at helping children with dysgraphia improve writing efficiency and accuracy. The proposed system integrates hardware and software components, including Raspberry Pi, sensors, and machine learning algorithms, to provide real-time assistance. The system leverages computer vision and neural networks to detect handwriting patterns and provide corrective feedback. This approach enhances learning outcomes, improves motor skills, and boosts confidence among affected children.

KEYWORDS: Dysgraphia, Machine Learning, Raspberry Pi, Computer Vision, Assistive Technology, Handwriting Recognition

INTRODUCTION

Dysgraphia is an euro logical disorder characterized by impaired handwriting, spelling, and writing organization skills. Children with dysgraphia often face academic challenges due to illegible writing, inconsistent spacing, and poor motor coordination.

This project proposes an innovative exam assistance system using artificial intelligence and embedded systems to help such children write effectively. The system aims to:

- Improve handwriting quality
- Provide real-time correction
- Enhance learning experience through assistive technology

MATERIALS AND METHODS:

The proposed system consists of:

Hardware Components

- Raspberry Pi
- USB Camera
- Display (LCD/Monitor)
- Keyboard & Mouse

Software Components

- Python Programming
- Open CV for image processing
- Machine Learning models for handwriting recognition

Working Principle

1. Capture handwritten input using camera
2. Process image using OpenCV
3. Analyze handwriting using ML model
4. Provide feedback via display

Hardware Requirements

- Raspberry Pi (with SD card)
- USB Webcam
- Power Supply
- Display unit

Software Requirements

- Python IDE
- Open CV library
- TensorFlow/Machine Learning libraries
- Raspbian OS

Research Paper

RESULTS

The developed model demonstrated the ability to:

- Capture handwritten input in real time using a camera module
- Process images using computer vision techniques
- Recognize characters withs Atis factory accuracy
- Provide corrective feedback to improve handwriting quality

The system showed noticeable improvement in:

- Letter formation and structure
- Spacing between words and characters
- Writing consistency over repeated trials

Accuracy of handwriting recognition was found to be dependent on:

- Lighting conditions
- Came rare solution
- Quality of handwriting input

Despite these constraints, the system per formed reliably for basic handwriting assistance tasks.

DISCUSSION

The results indicate that integrating machine learning with assistive hardware can significantly enhance writing capabilities in children with dysgraphia.
Compared to traditional methods (manual correction, therapy sessions), the proposed system provides:

- **Real-time feedback**, which helps users immediately correct mistakes
- **increased engagement**, due to interactive learning
- Reduced dependency on human supervision

The use of image processing and pattern recognition enables the system to detect irregularities in handwriting such as:

- Uneven letter sizes
- Incorrect stroke patterns
- Poor alignment

However, certain limitations were observed:

- The system requires proper environmental setup (lighting, positioning)
- Recognition accuracy may decrease for highly distorted handwriting
- Initial training of the model requires sufficient dataset samples

CONCLUSIONS

This paper presented the design and development of an assistive exam kit for children with dysgraphia, aimed at improving handwriting skills and enhancing academic performance. By integrating embedded systems with machine learning and computer vision techniques, the proposed system provides real-time feedback on handwriting, enabling users to identify and correct errors instantly.

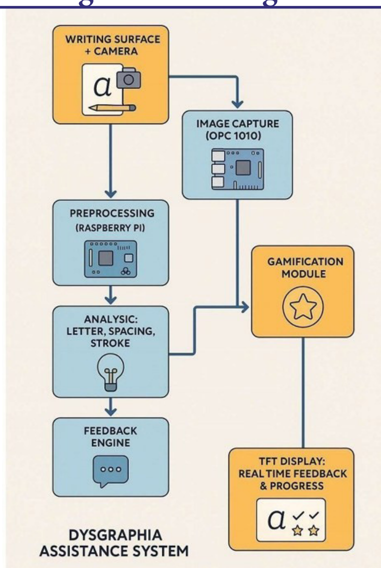
The system demonstrates that technology-driven solutions can effectively support children with learning disabilities by improving writing clarity, consistency, and speed. The use of a low-cost platform makes the solution accessible and practical for educational institutions and special learning environments.

Although the system performs well under controlled conditions, certain limitations such as dependency on lighting conditions, camera quality, and dataset variability were observed. Addressing these challenges can further improve the robustness and accuracy of the system.

Overall, the proposed exam kit offers a promising approach toward assistive education, contributing to increased confidence, independence, and learning efficiency among children with dysgraphia.

Tables and figures:

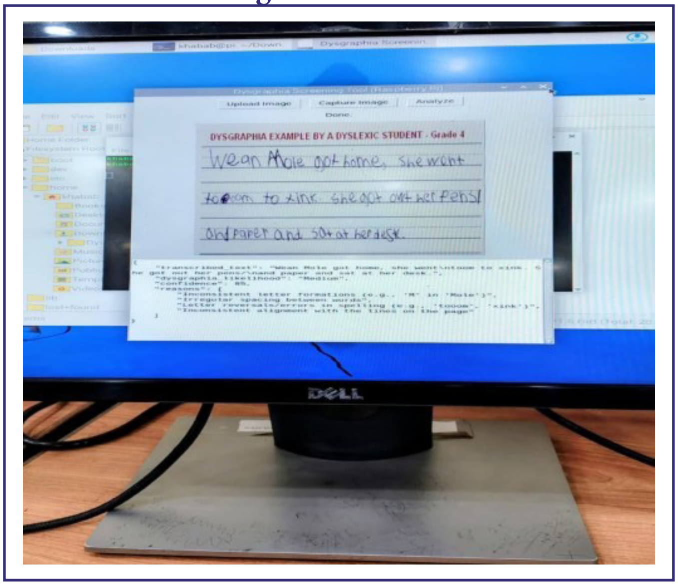
Fig. 1: block diagram



Working Flow

1. User writes on paper
2. Camera captures image
3. Raspberry Pi processes the image
4. Open CV cleans and segments data
5. ML model analyzes handwriting
6. System displays corrections and feedback

Fig. 2: execution



The image shows the working output of the Dysgraphia Screening Tool developed on a Raspberry Pi. The system provides a user-friendly interface with options to upload or capture handwritten input and analyze it. Once the image is processed using image processing and machine learning techniques, the system converts the handwriting into digital text and evaluates it for dysgraphia. It displays the likelihood level, confidence score, and specific reasons such as inconsistent letter formation, irregular spacing, spelling errors, and misalignment. This demonstrates how the system effectively detects handwriting difficulties and provides meaningful feedback for improvement.

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