**INTRODUCTION**

Variabilities in Online Handwriting:
- Writing style variations among individuals.
- Stroke order and stroke direction variability.

Existing Approaches:
- Allograph modeling: Build model for each Allograph.
- Hidden Markov Model (HMM), Support Vector Machine (SVM).

Shortcoming of Existing Approaches:
- Added Complexity due to Allograph.
- Smoothing effect in HMM.
- A subset of training sample is selected in SVM.

Advantage of Sparse Representation (SR):
- Can accommodate all diverse training samples in the dictionary.
- Can adopt the support adaptively for each test sample.
- Lower decoding complexity compare to HMM and SVM.

**OBJECTIVES**

1. Development of SRC-based HR approach for character and limited vocabulary word recognition tasks.
2. Exploration of exemplar and learned exemplar dictionaries for online HR.
3. Sparse coding based on \( l_0 \)- and \( l_1 \)- norm minimization.

**SPARSE REPRESENTATION**

- Given: \( Dz = x, D \in \mathbb{R}^{M \times N} \), \( x \in \mathbb{R}^M \) such that \( M < N \). Find \( z \in \mathbb{R}^N \) as: \( \min \| z \|_0 \) subject to \( \| Dz \|_2 < \epsilon \). \( D \) is dictionary, \( x \) is the signal and \( z \) is the sparse vector.
- Dictionay creation: Exemplar dictionary, learned exemplar dictionary using KSDV algorithm.
- Sparse coding algorithm: Orthogonal Matching Pursuit (OMP), Least Angle Regression (LARS).

**RESULT AND DISCUSSION**

<table>
<thead>
<tr>
<th>Database</th>
<th>Task</th>
<th># Class</th>
<th># Samples</th>
</tr>
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<tbody>
<tr>
<td>Assamese</td>
<td>Digit</td>
<td>10</td>
<td>3100</td>
</tr>
<tr>
<td>UNIPEN</td>
<td>Digit</td>
<td>10</td>
<td>14638</td>
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<tr>
<td></td>
<td>(English)</td>
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<td>24639</td>
</tr>
<tr>
<td></td>
<td>Lowercase</td>
<td>26</td>
<td>4047</td>
</tr>
</tbody>
</table>

Table 1: Samples in Assam. and UNIPEN databases.

**FUTURE RESEARCH**

- The advanced dictionary learning techniques such as label consistent and block K-SVD algorithms can be explored for online handwriting recognition.

**REFERENCES**


**CONTACT INFORMATION**

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**EXPLORING SPARSE REPRESENTATION FOR IMPROVED ONLINE HANDWRITING RECOGNITION**

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