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# Characters and Digits Recognition Using Neural Networks

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# Abstract

- **Motivation**: Using Neural Networks to perform digits and characters recognition on DSP Board.

- **Goal**: Allowing user to write characters and digits on paper and display the printed version of them on a display in a relative short time.

- **Application**: Conversion from handwritten characters to printed forms.

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# Abstract

- **Method**:
  - Having user to write any characters or digits on a white paper (with gridlines)
  - Using a camera to capture user's writing
  - Using pre-trained model to obtain weighted matrix (CNN related)
  - Using DSP board to perform recognition
  - Using a display to output the recognized characters or digits

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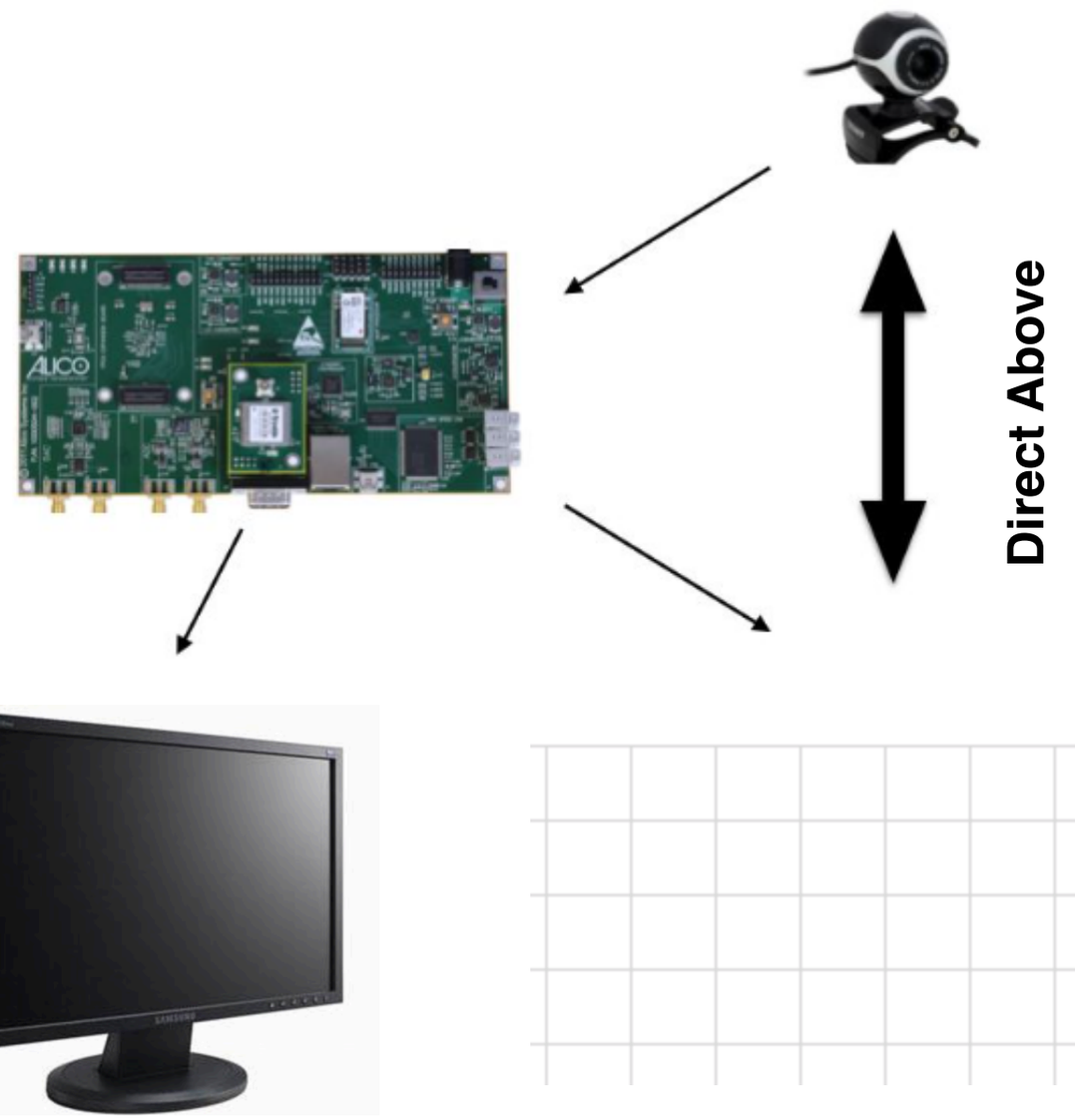
# Description of System

- **System consists of:**

  Camera

  DSP Board

  Display



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# Description of Possible Algorithms

- **Possible Algorithms:**

  K-nearest-neighbors

  Linear classifier (1-layer NN)

  Convolutional net LeNet-5

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# Complexity Analysis

- Size of Neural Networks
- Training for Neural Networks
- Accuracy on characters and digits recognition
- Speed of testing on DSP
- Display on screen

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# Major Challenges

- Understanding Neural Networks
- Training for Neural Networks basing on TensorFlow
- Using camera inputs as tests
- Using simple networks to achieve a high enough accuracy
- Speed of testing on DSP

# Modeling Tasks

- Using **The Chars74K** dataset, which is for hand-drawn characters.
  - 55 samples per class.
  - The pen stroke trajectories are provided,
  - Using for on-line handwritten character recognition methods.

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# Human Factors

- The size of characters that user writes
- Inside gridlines or Outside gridlines
- care vs poor handwriting

# Training

- This project requires training on a small neural network. The training and testing samples from The Chars74 dataset

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# Rough Schedule

| | Best Case | Worst Case |
|---|---|---|
| **Constructing and Training Neural Network** | Feb 27-03 | Feb 27-03 |
| **Display of 55 different characters on screen** | March 06-10 | Feb 27-03 |
| **Applying NN to DSP** | Spring Break | Mar 20-24 |
| **Finishing Up and Testing** | Mar 20-24 | Mar 27-31 |
| **Optimizing computational Speed** | Mar 27-31 | Before April 5th |

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# Final Test

- User should write any characters (Uppercase or Lowercase) and digits on a paper with gridlines

- When user finish writing all characters/digits, user need to hit a button to signal the finish of writing

- After a relative short amount time, the handwritten characters/digits should be displayed on the screen in their printed forms

- The accuracy of this transformation should be high.

- We should allow some mistakes, like distinguishing 0-O, 1-I.

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# Board

- DaVinci: Digital Video Processor
- Camera
- Display

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# References


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