Online Flowchart Recognition & Feedback

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CSCE624 Sketch Recognition

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Introduction

Introduction

1. Flowchart conveys the logic intuitively
2. Learn to code by sketching
3. Understand control flow
4. Sketching on paper
    - Less interactive
    - Boring
    - No Feedback

Introduction

So, we created an Online Flowchart Recognition and Pseudo Code Creator Tool

Prior Work

Prior Work

1. Structure of diagram and Grammar[1]
2. Use SVM and HMM[6][2][4]

Methodology

Methodology

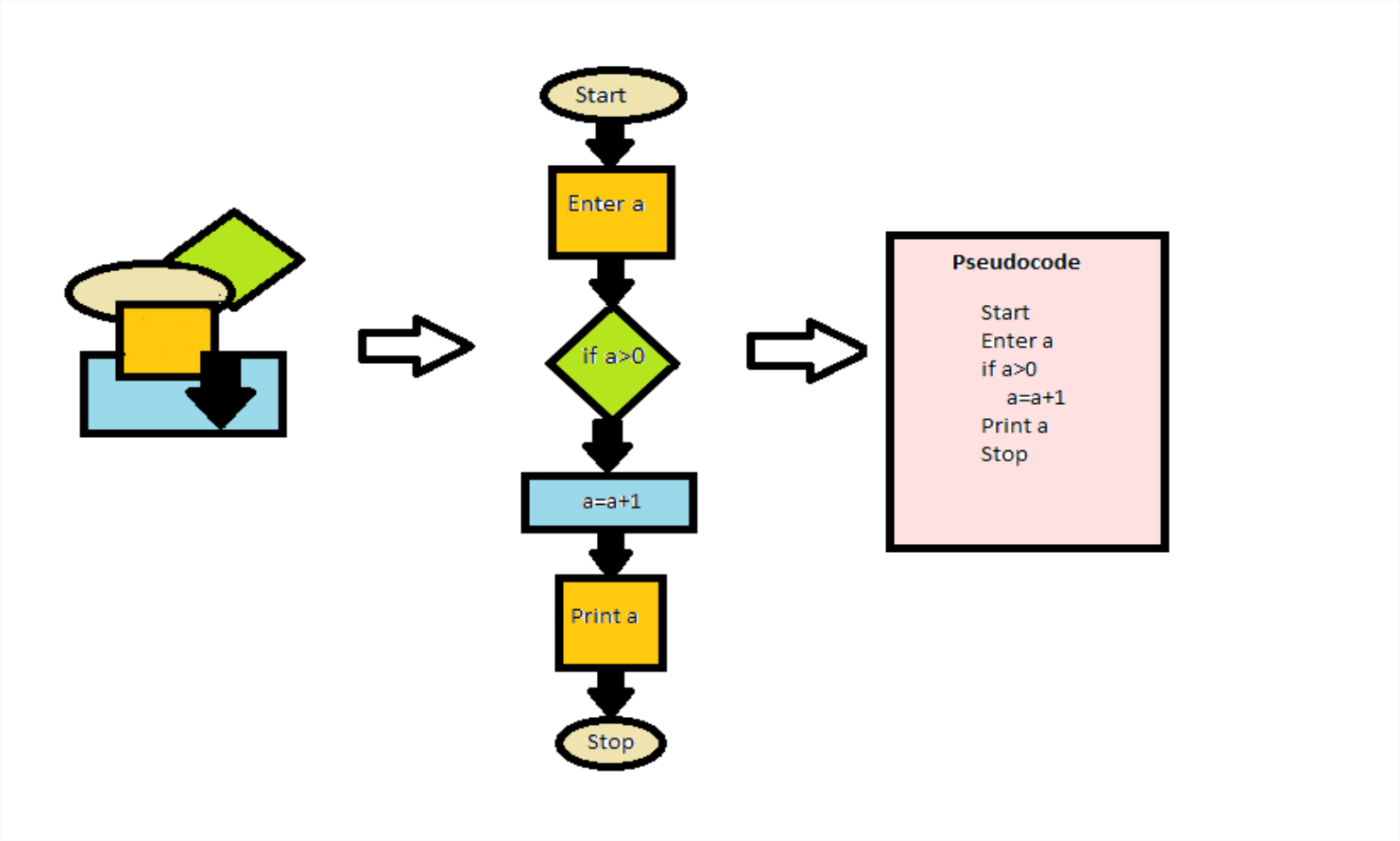


Figure 1: Main method

Methodology

1. Identify structural components - Rubine features[5], Paleosketch [3]
    - Ellipse - Start and Stop
    - Rectangle - Computation
    - Diamond - Decision
    - Square - Input/Output
2. Create a connected structure
3. Convert the connected structure to pseudocode
4. Check for validity using DFS

Features

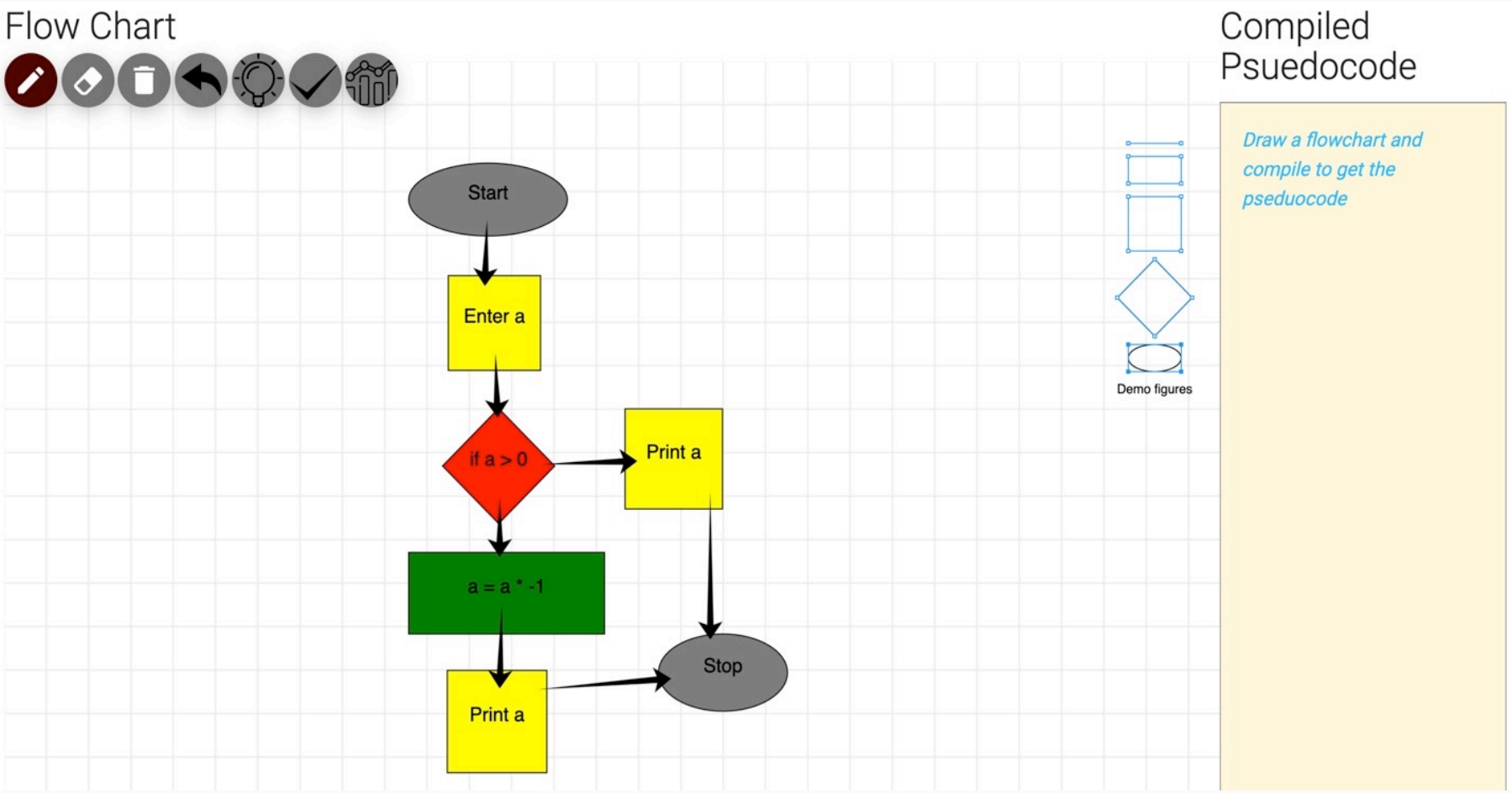
Features

1. Canvas to sketch the flowchart & Paper.js
2. Buttons for easy manipulation
    - Undo last action
    - Generate pseudo code
    - Evaluation Metrics
    - Validation of Flowchart

Github Link:
https://github.com/aswin-jacob-thomas/FlowChart-Recognition

The system is deployed in AWS EC2 instance at:
http://flowchart.us-west-2.elasticbeanstalk.com/

Flowchart


Flow Chart
Start
Enter a
if a > 0
Print a
a = a * -1
Print a
Stop
Demo figures
Compiled Psuedocode
Draw a flowchart and compile to get the pseduocode

Validity Check

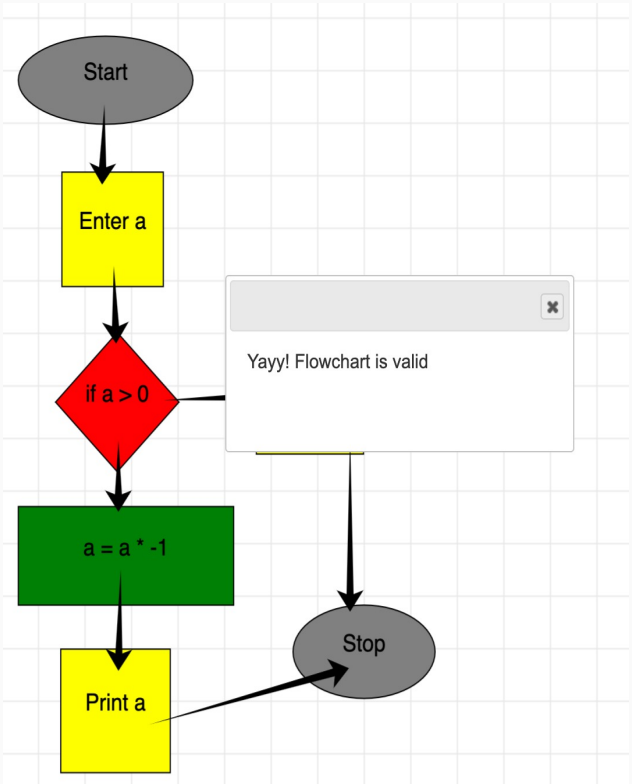


Figure 2: Valid Flowchart

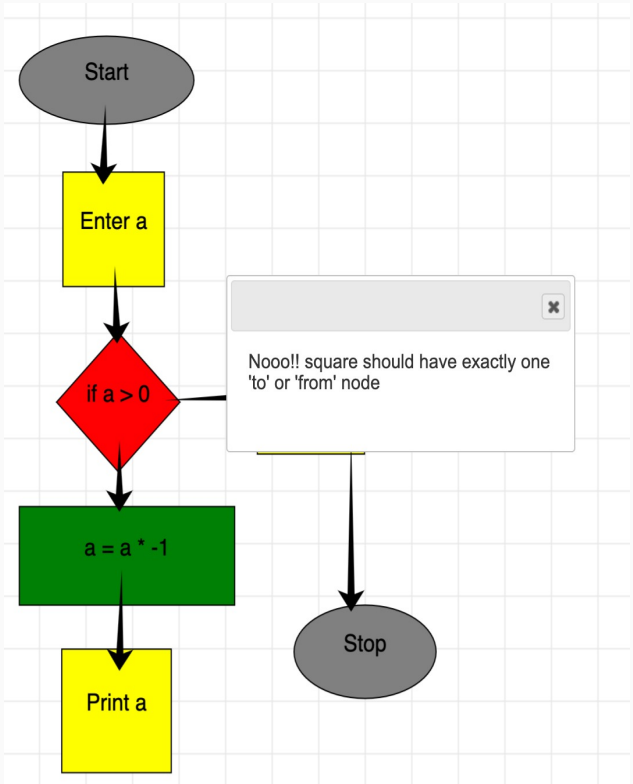


Figure 3: Invalid Flowchart

Code Generation

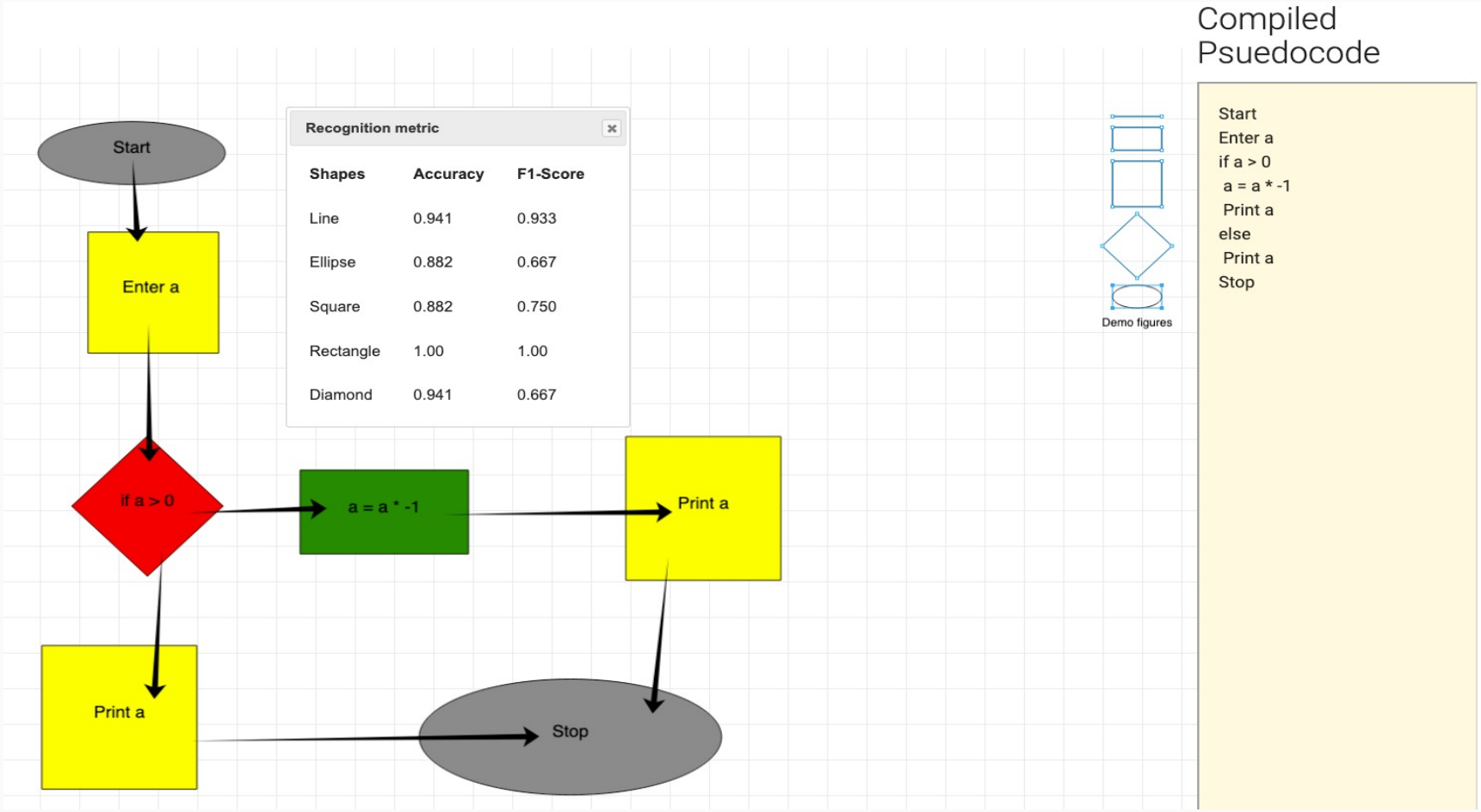


Figure 4: Flowchart with metrics and generated pseudo-code

Demo

Click here for demo

Evaluation & Results

Evaluation & Results

Result

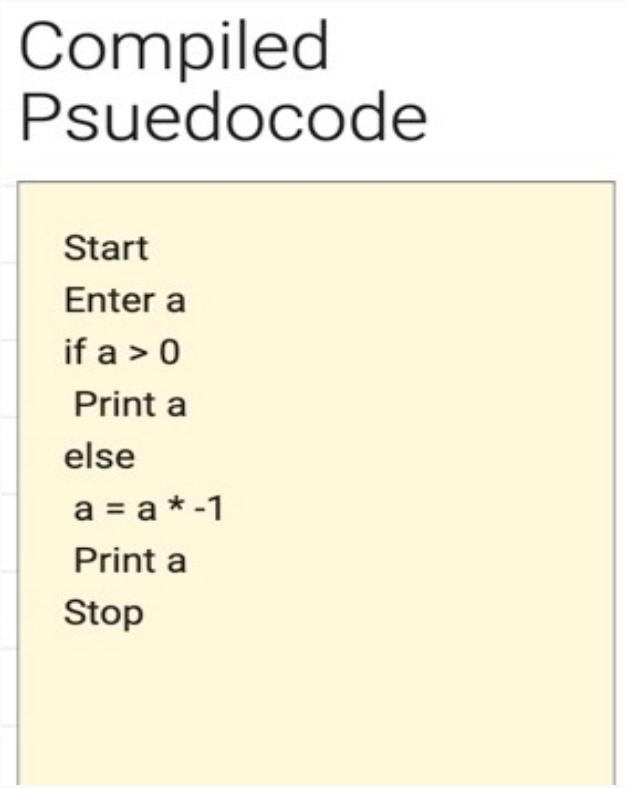


Figure 5: Sample Result

Evaluation Metrics

Metrics	Accuracy	F-Score
Ellipse	0.908	0.755
Rectangle	1	1
Diamond	0.908	0.581
Square	0.951	0.873
Line	0.972	0.968

Conclusion & Future Work

Conclusion & Future Work

- Successful generation of pseudo code from flowchart
- Validity of the flowchart can be checked
- Recognition rates of each symbol for a particular session can be viewed on the page itself
- **Future Work**
  - Enable recognition of Loops
  - Generate language specific code
  - Enhanced interaction at each level
  - Better recogniton rates

References

[1] Cérès Carton, Aurélie Lemaitre, and Bertrand Coüasnon. Fusion of statistical and structural information for flowchart recognition. In *2013 12th International Conference on Document Analysis and Recognition*, pages 1210–1214. IEEE, 2013.

[2] Elvis Wai Chung Leung, Fu Lee Wang, Lanfang Miao, Jianmin Zhao, and Jifeng He. *Advances in Blended Learning: Second Workshop on Blended Learning, WBL 2008, Jinhua, China, August 20-22, 2008, Revised Selected Papers*, volume 5328. Springer, 2008.

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[3] Brandon Paulson and Tracy Hammond. Paleosketch: accurate primitive sketch recognition and beautification. In *Proceedings of the 13th international conference on Intelligent user interfaces*, pages 1–10. ACM, 2008.

[4] Lawrence R Rabiner. A tutorial on hidden markov models and selected applications in speech recognition. *Proceedings of the IEEE*, 77(2):257–286, 1989.

[5] Dean Rubine. Combining gestures and direct manipulation. In *Chi*, volume 92, pages 659–660, 1992.

[6] Zhenming Yuan, Hong Pan, and Liang Zhang. A novel pen-based flowchart recognition system for programming teaching. In *Workshop on Blended Learning*, pages 55–64. Springer, 2008.