



EE-451: Image analysis and pattern recognition

Special Project

Christopher Hémon, Rami Azouz,
Rayan Chaouche



28 May 2020

Outline

- Assumptions
- Methodology
- Conclusion

Assumptions

- The arrow selects a symbol if its center of mass is close enough to the center of mass of a symbol
- First symbol is always a number
- We can't have a repetition of two symbols of the same kind
- Last symbol is the equal sign
- Arrow is always red, other symbols are dark on a bright background
- Lighting condition consistent for all inputs

Methodology (1)

Finite state machine is used:

- Obtaining the arrow center of mass (cm) and symbols from first frame
 - Arrow using std on RGB channel
 - Symbols through image filtering, binary morphology and region growing
- Computing euclidean distances between cm of arrow and symbols:
 - Symbol with smallest distance kept
 - Symbol is selected by the arrow if distance < threshold

Methodology (2)

- Symbol classification:
 - Using assumptions, cases are distinguished
 - Compacity method used for mathematical operators
 - LeNet neural network used for numbers
- Arrow trajectory and resulting equation drawn on frames
- Video computed from frames to avi

Conclusion

- Benefit :
 - Method invariant to symbol orientation, color and scale
 - Robust to distance between symbols
- Limitations:
 - Arrow color dependent
 - Processing thresholds non flexible
 - Limited by resolution