Projects in Electrical & Computer Engineering 2007-2008

Spatial Domain Interference Removal (SDIR)

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Sponsor: CGA EE DEPT.

Generic Slide

- First level bullet
  - Some subtext…
    - And more…
    - Use this slide for most slides
    - Overall format of presentation is on following slides…

Outline of Talk

Introduction

- What, Why, Impact, Relevance

Background

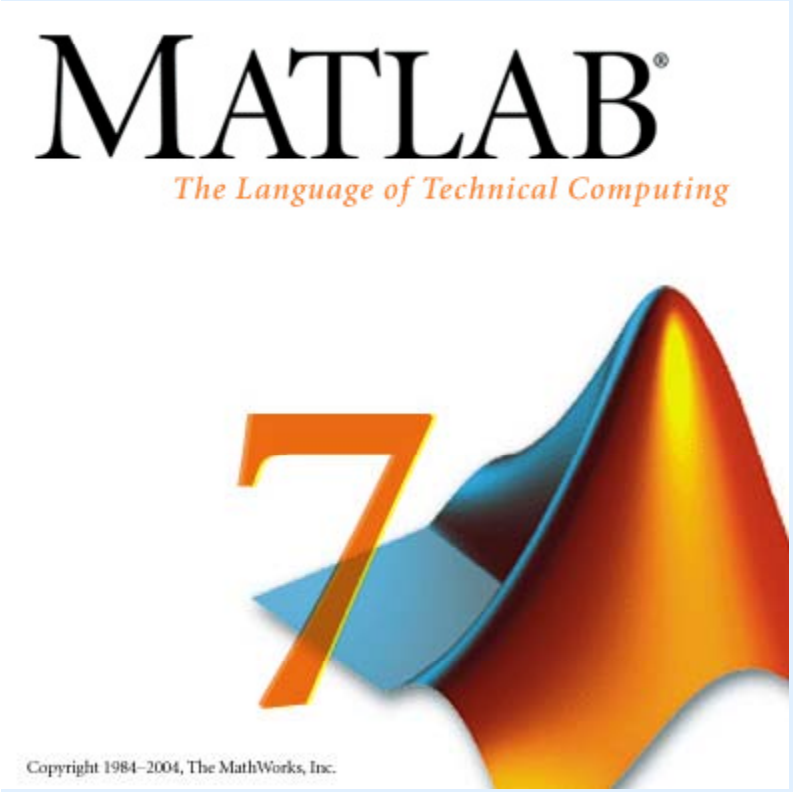
- History
- What accomplished in previous years

Objective(s)

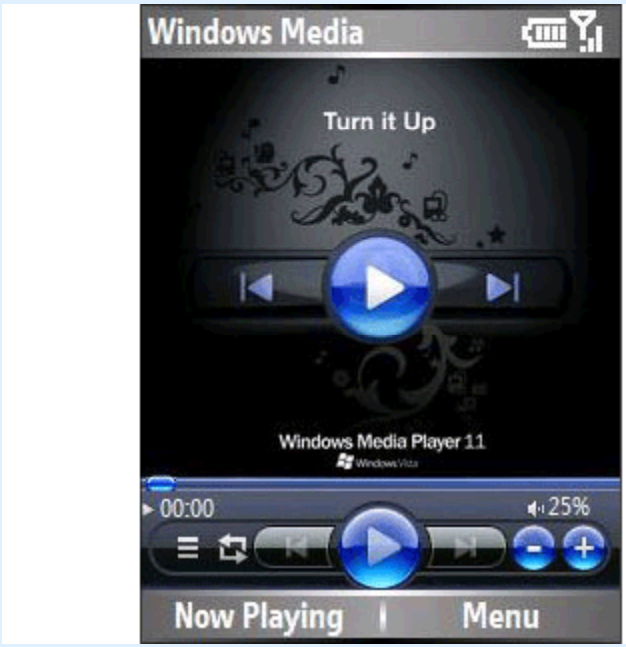
Technical Approach Overview

- AVG
- Median
- Quantizing followed by Mode (most common)
- Obj detection and filling the hole(s)
- Impainting
- The use of maximum likelihood
- Etc...

Tools



misclab.umeoce.maine.edu



www.am-soft.ru

http://enscreenshots.softonic.com/s2en/65000/65953/3_windows_media_player_skin_1.jpg

Process Diagram

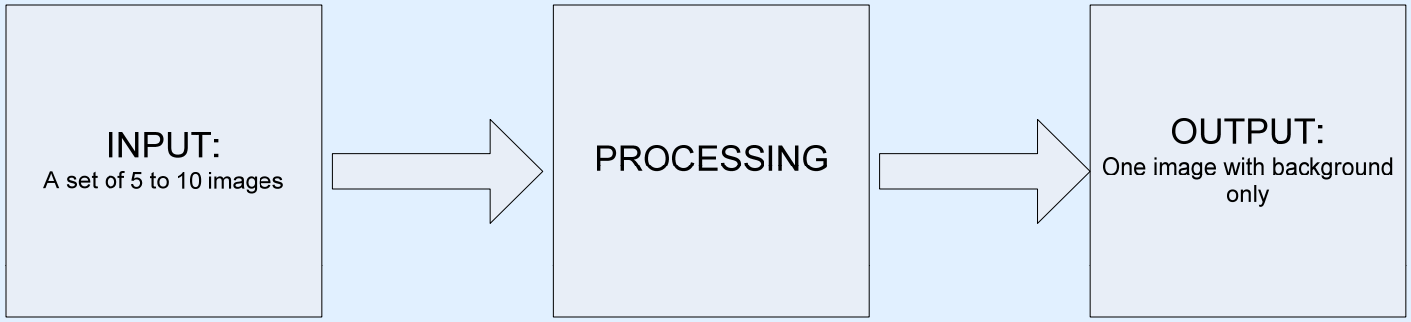
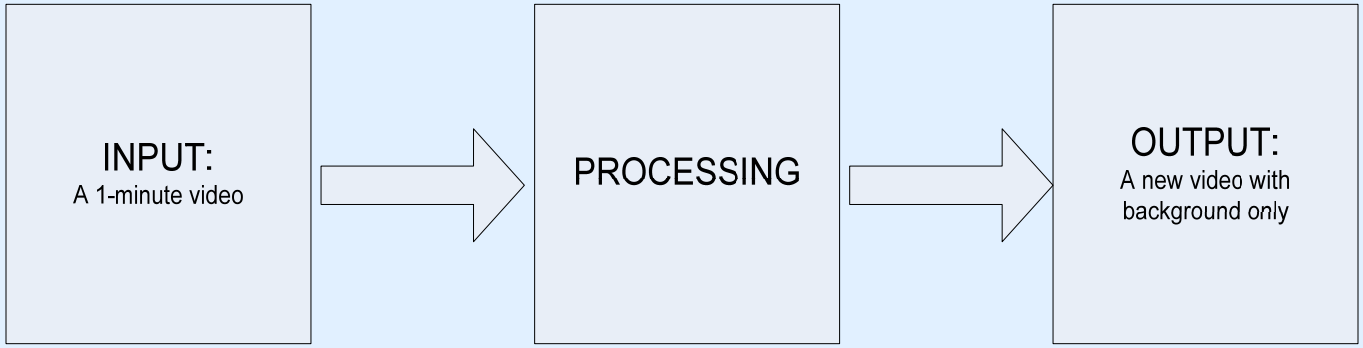


Image processing diagram

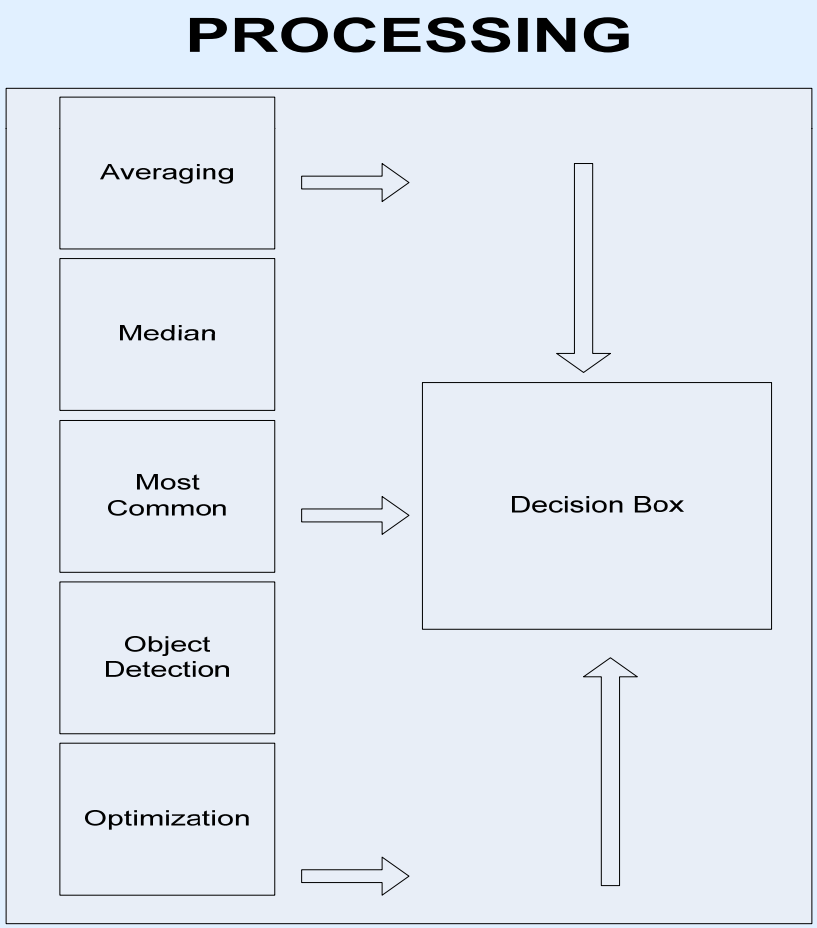


Video processing diagram

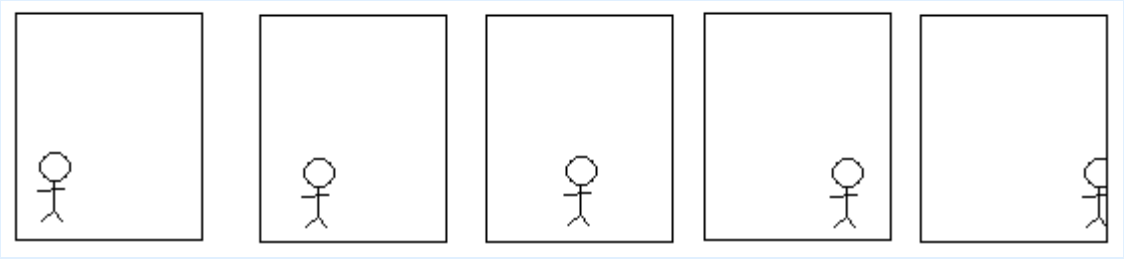
*** For video, the output will be black and white video only

Finial Algorithm

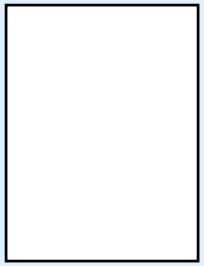
- Many factors will be considered in deciding what is the optimal solution.



Avg images



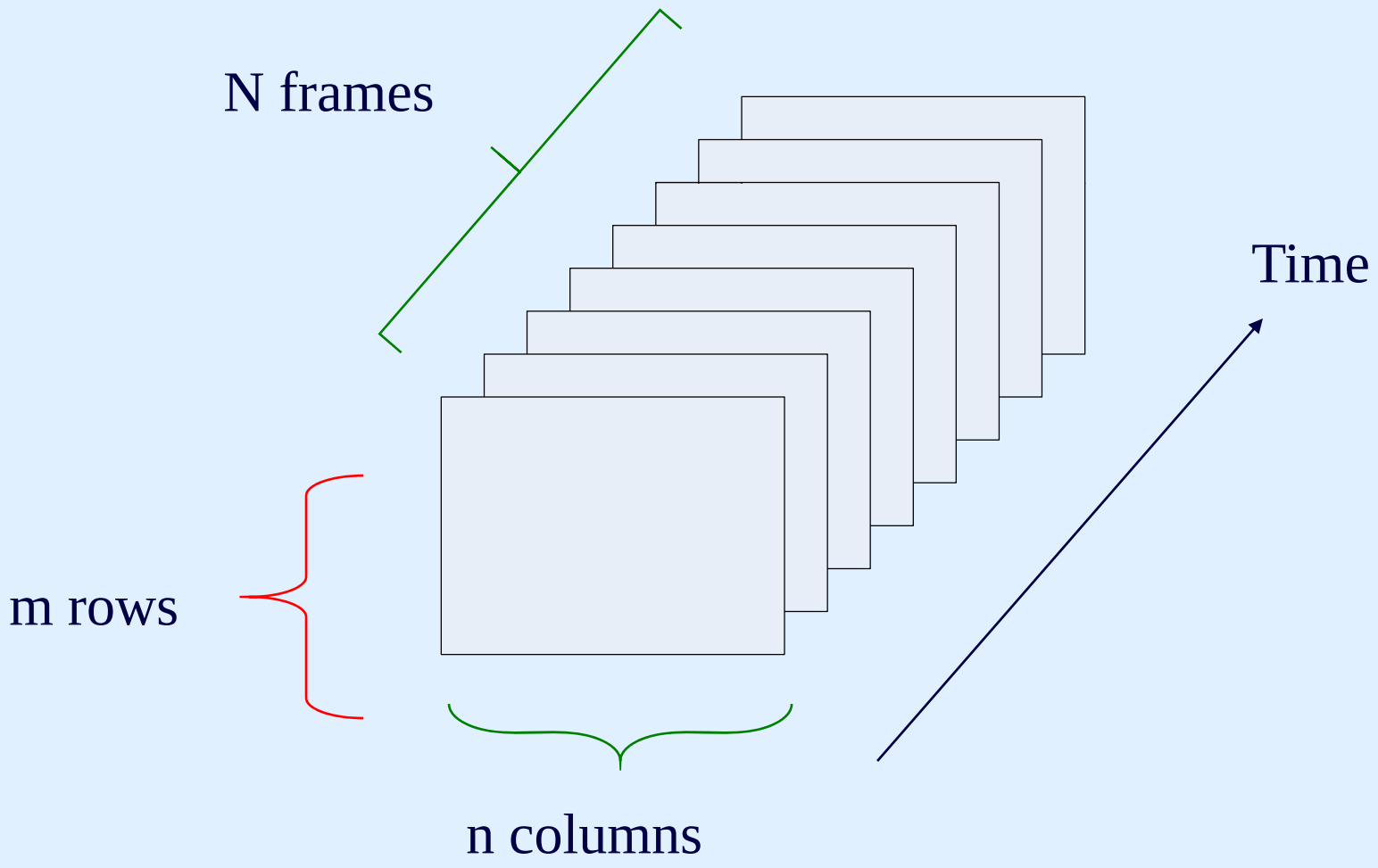
Result =



$$\mathrm{Re}\,sult = [\frac{A1(1,1) + A2(1,1) + A3(1,1) + A4(1,1) + A5(1,1)}{5}]$$

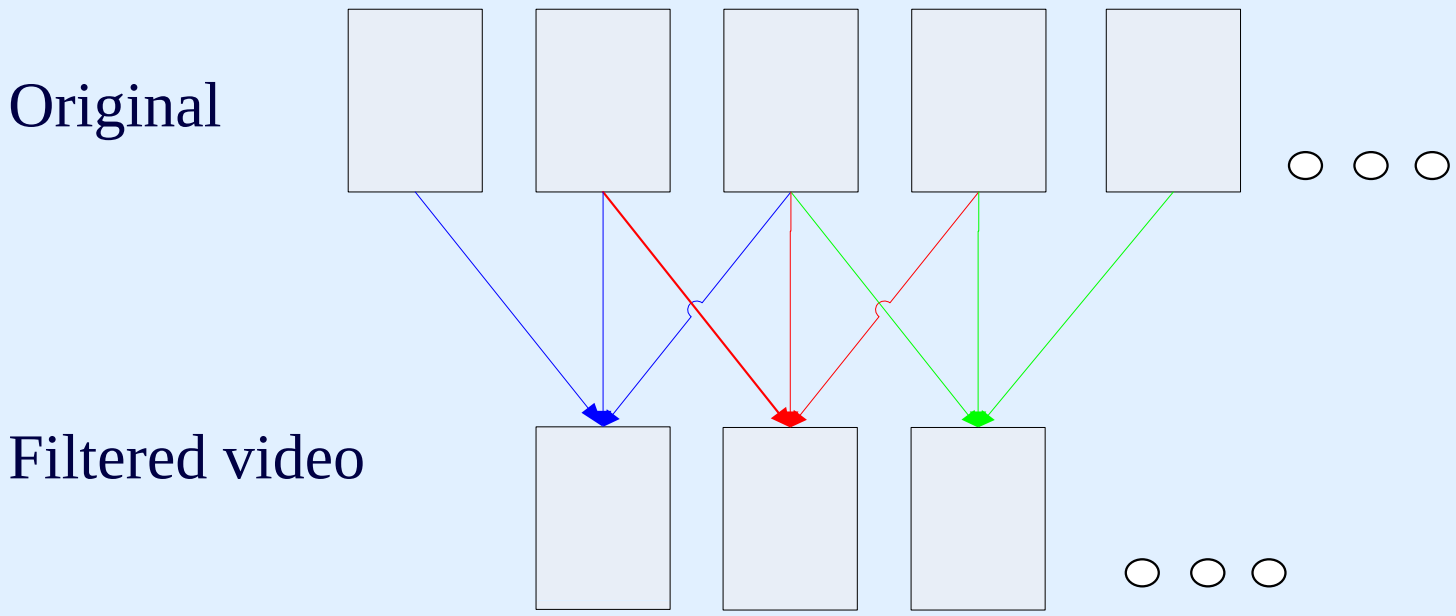
*** This is a pixel by pixel operation ***

Video Structure



Avg video

- Number of frames to be avged is determined.
- The ops stops when the last frame is avged.



Video processing diagram

Median filter for Img

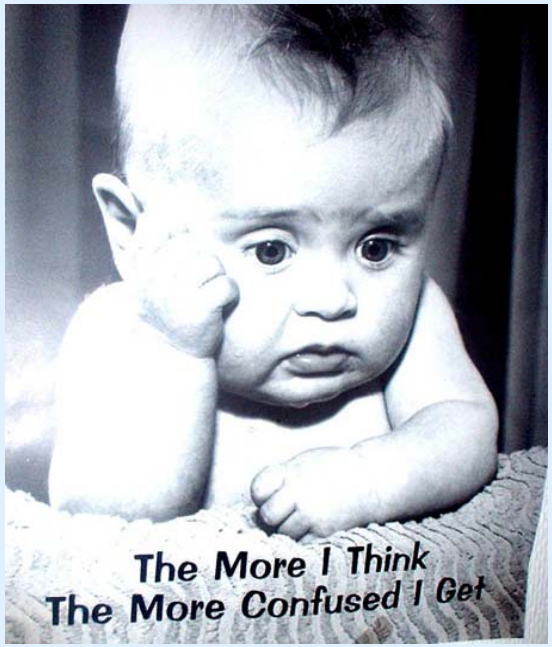
- Similar to AVG
- Taking Median instead of avg
- Linear operation just like AVG
- Pixel-by-Pixel

See example

Result(1,1) = Median [A1(1,1), A2(1,1), A3(1,1), A4(1,1), A5(1,1)]

Median filter for Video

- SAME concept ➔ But take Median
- Sample code…




```
for …
        for….
                for…
                        ……..?????.....
                        ……..?,,,????
                end
        end
end
fram2im..
movie (…)?
```

Underway

- Quantization & Mode
- Why not just mode

  Ex: Given a set of 9 images

  Let’s set 8 is the good value

Input = [7, 9, 8, 22, 23, 22, 8, 22, 9]

Mode = 22 (most repeated) = No good

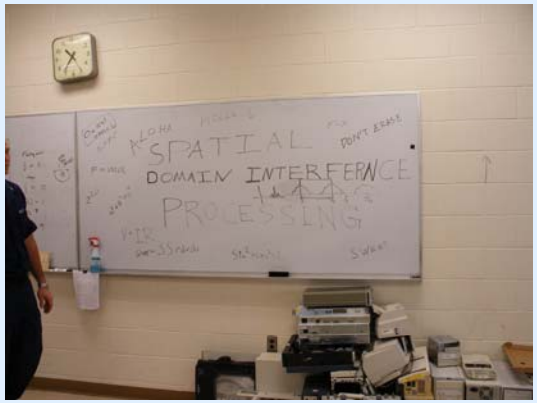
However….

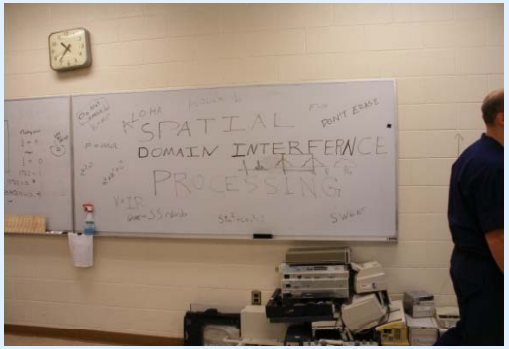
Quantized input = [8, 8, 8, 22, 22, 22, 8, 22, 8]

Mode = 8 good!

Results

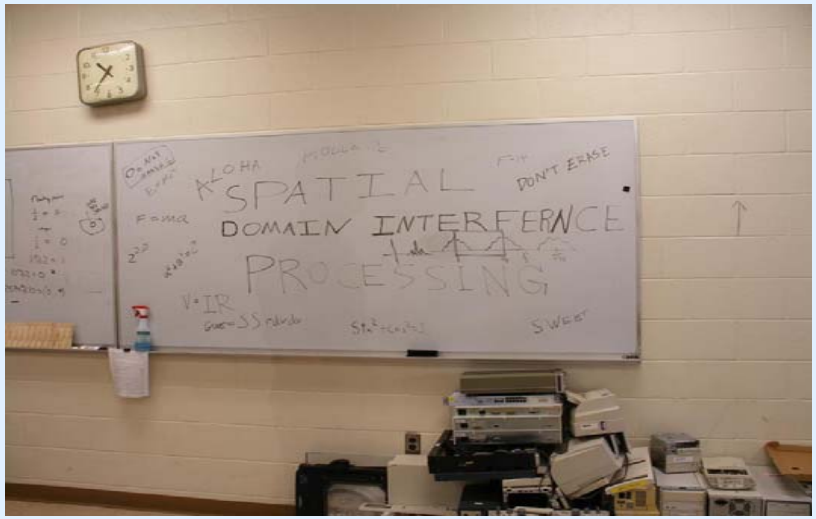
- Number of frames to be processed increases ➔ the better results (remove interference almost completely or completely)
- Time duration: more frames take longer
- AVG tends to process faster than Median, given the same parameters (i.e. same video, same number of frames to be avged)
- For video, clearly, output will have less number of frames than the original. The diff is # of frames to be avged.





Avg

Median



Video AVG Filter

10 frames are avged

Video AVG

100 frames are avged

Median Filter

100 frames are taken median

Eval Results

- Not perfect b/c linear system
- weights the distorted pixel equally with the non-distorted.
- Long duration needed for processing Video : could be hard to achieve real time.
- SO…we will continue to do some more fun!

Conclusions

- Summary

  - camera captures items not intended

  - need algorithm that can remove interference effectively; (time, quality of output, maintenance, etc.)

  - to improve national security and other org.

  - Strategy, from easy to complex method

  - AVG vs Median: coding, time to process, and quality of the output

Future Work

- PMP timeline

  Most Common

  Object detection + Filling hole(s)

  Impainting

  Maximum likelihood

  More and more complicated algorithm

Acknowledgement

- Advisor
- EE Dept.