Design and implementation of a technique to track moving objects based on optical flow

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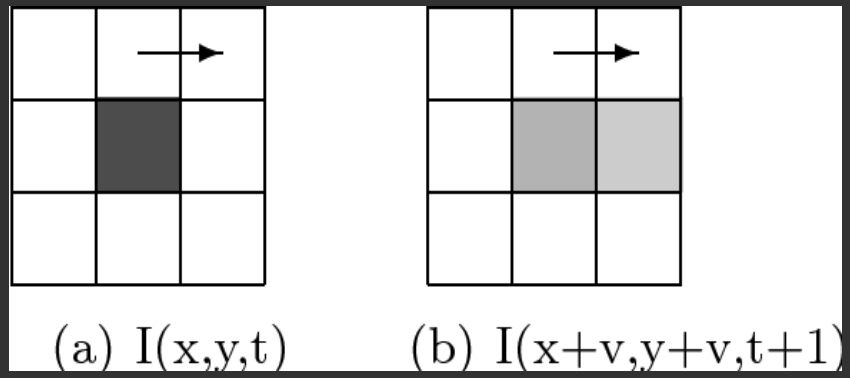
Optical flow concepts



http://www.jarnoralli.fi/joomla/images/images/what_is_oflow_wb.png

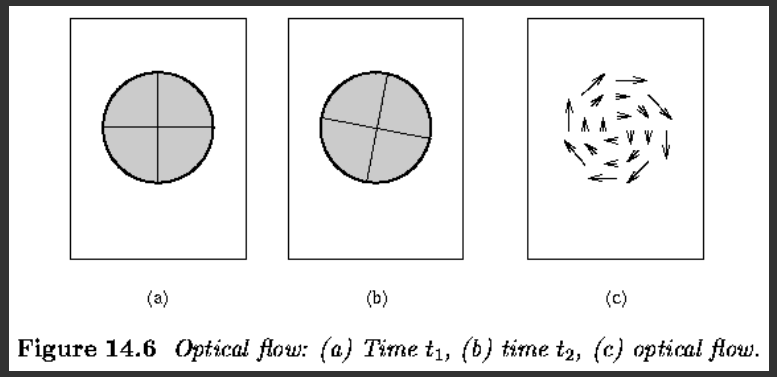


Figure 14.6 *Optical flow: (a) Time t_1, (b) time t_2, (c) optical flow.*

http://user.engineering.uiowa.edu/~dip/lecture/Motion2.html

Horn–Schunck method

vs

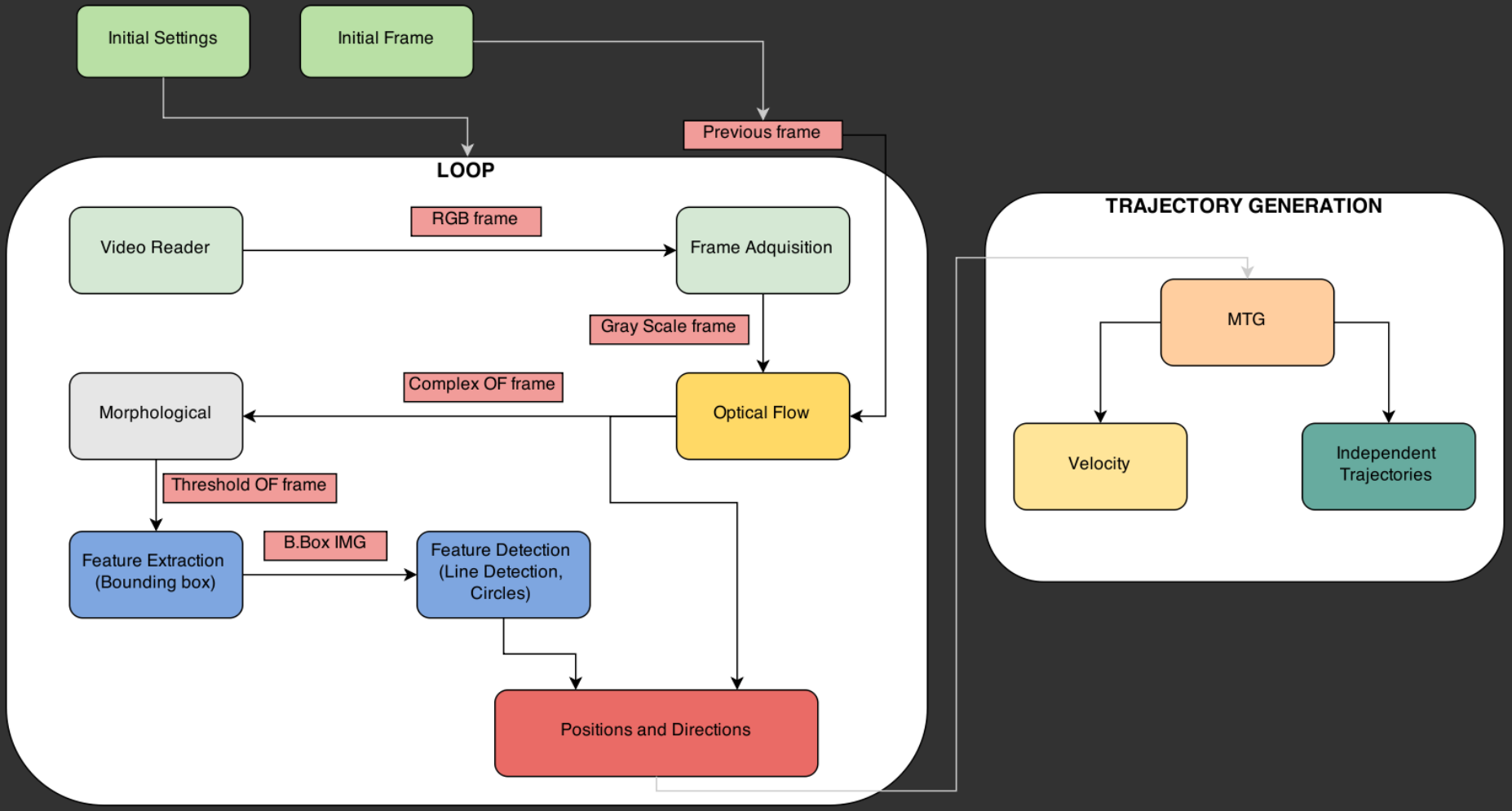
Lucas Kanade method

- High density of flow vectors
- Sensitive to noise

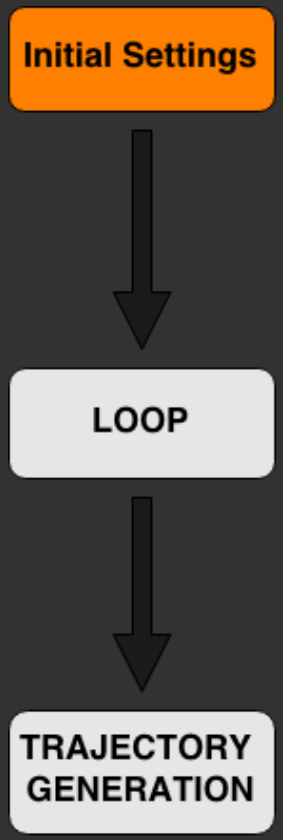
Conditions

- The objects are balls of the **same size, no matter the color**.
- The **number of trajectories** along the video are **not defined**.
- **Crossing trajectories**.

Coding scheme



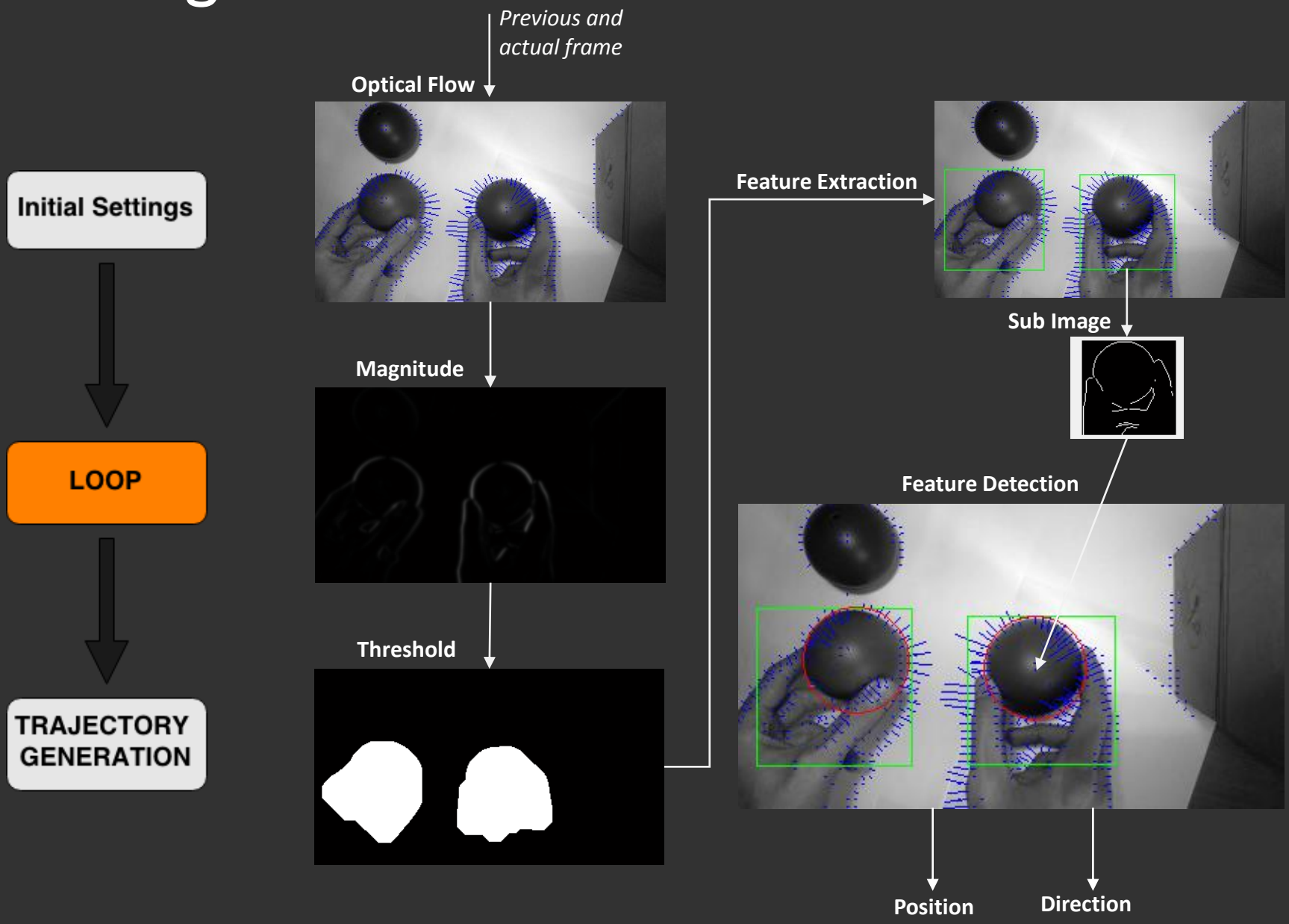
Coding scheme



Settings

- Optical Flow
- Plotting
- Players
- Paths
- Video
- Initial frame

Coding scheme



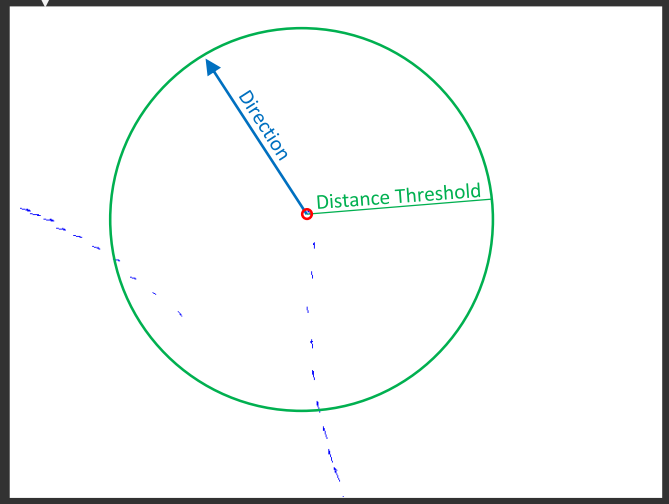
Coding scheme

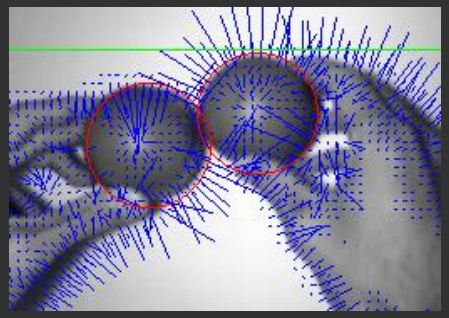
Initial Settings

LOOP

TRAJECTORY GENERATION

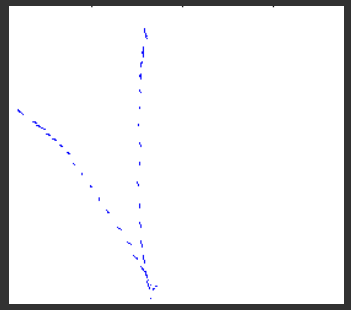
Positions and Directions

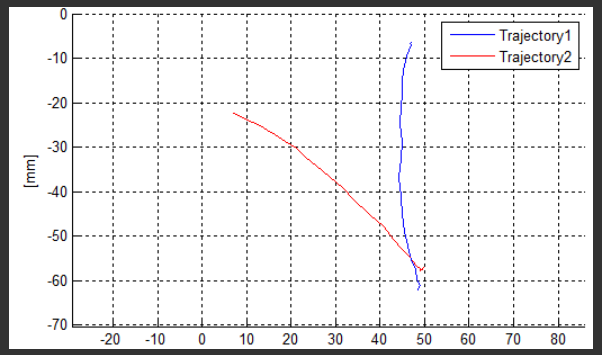




-Distance threshold balance.

-Multi-Trajectory generation according to the position and Direction in each frame





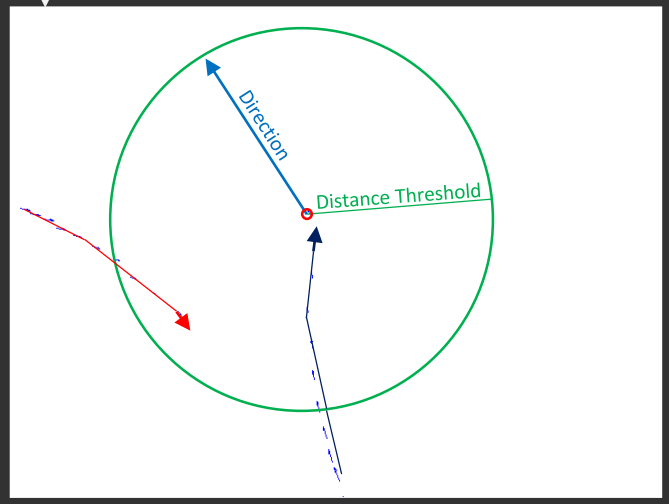
Coding scheme

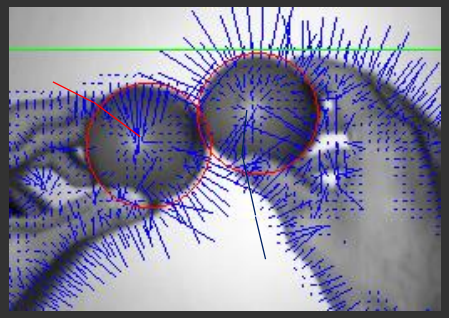
Initial Settings

LOOP

TRAJECTORY GENERATION

Positions and Directions





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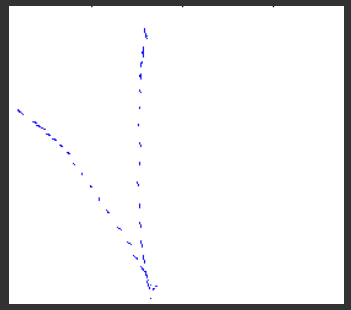
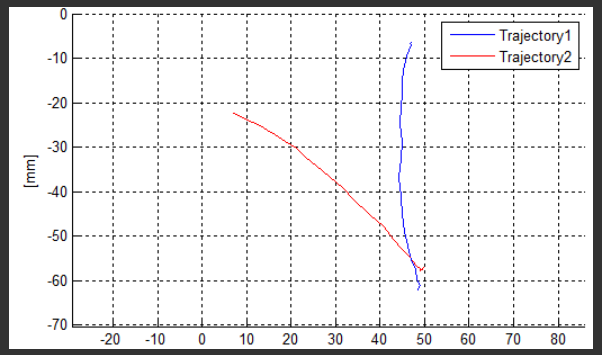
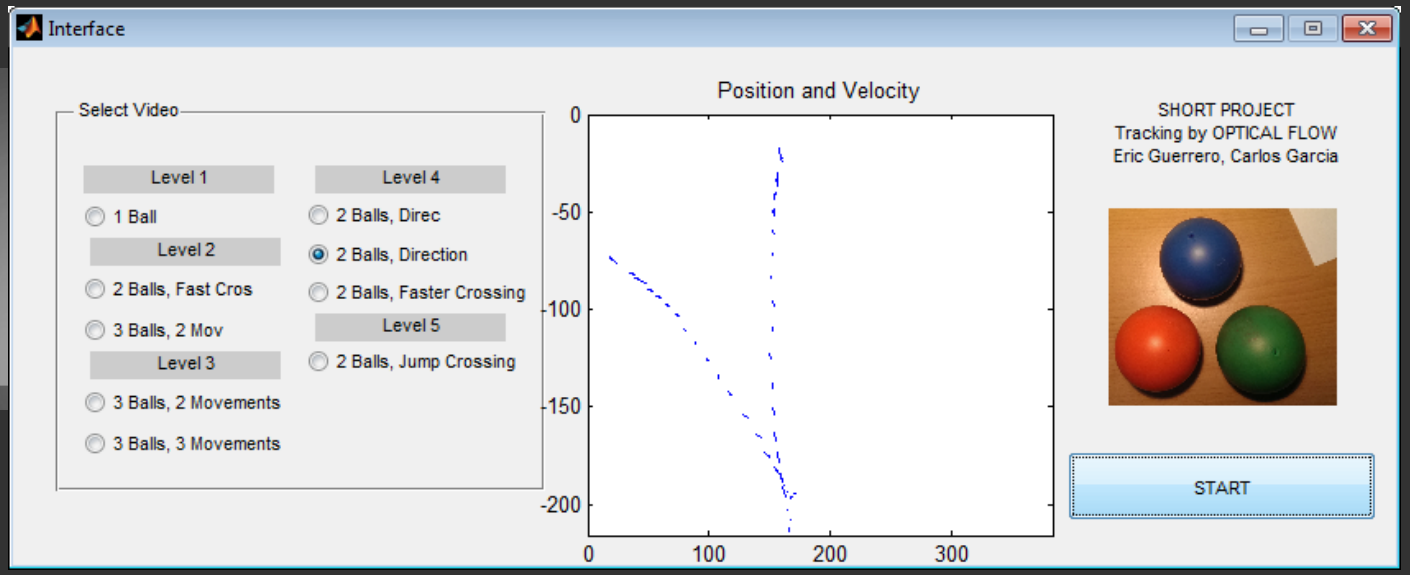




Coding scheme

Main Blocks



Conclusions

Comparison with Optical flow Methods			
Name	**Link**	**Frame average (s/frame)**	**Comment**
Optical Flow(BBx)	MainCode.m	0,2742	Main code
Optical Flow	comp_nobbox.m	0,3173	Without Bounding Box analysis
Eco Code	comp_eco.m	0,1040	Whithout unnecesary presentations, resize, etc.

Comparison of Optical flow				
Name	**Link**	**Frame average (s/frame)**	**% over best time**	**Comment**
Optical Flow(BBx)	compOF.m	0,2046	**0,00%**	Without evaluating trajectories, only locating centers
Optical Flow	compOF_nobbox.m	0,2278	**11,34%**	
No Optical Flow	compOF_noOF.m	0,2204	**7,72%**	

Better performance using optical flow instead of without it:

- Complex objects
- Further overview

Conclusions

- This method is better for **objects that are moving by they own**
- Powerful ability for track objects in a lot of different situations
- Easy adaptation to other kind of objects
- Cheap computational cost → Semi-Real Time

Further steps

- Integrate the multi trajectory generation in the loop
- Adapt the feature detector for any kind of object, with a more powerful function

Questions?