

#### Tracking Multiple Animals in Laboratory Experiments with Mices: Prelimary Results

João Bosco O. Monteiro Dr. Hemerson Pistori (Advisor) Dr. Albert S. de Souza (Co-Advisor)

GPEC - Research Group in Engineering and Computing www.gpec.ucdb.br/topolino







Context and Motivation Open Field Experiment Very Simple Tracking Techniques Tools and First Experiments Preliminary Results Particle Filters Final Considerations



- TOPOLINO: Low cost, computer vision based, automation of animal behaviour analysis
- Most of Current Solutions are Expensive and Platform Dependent: Ethovision, 2020 Plus, Any Maze
- Many interesting open problems (tracking similar deformable objects)



Anxiety-provoking situation: mices move around less and tend to stay near the walls
Variables: speed, distance travelled, location (center, wall)







## **Very Simple Tracking**



## Thresholding and Binarization Fixed threshold choosen empirically













# Image Subtraction Background = First Frame





- ImageJ (Java Based DIP Framework) ImageJ Plugins:
  - ParticleAnalyzer (Simple Connected Components – Blobs – Segmentation)
  - MultiTracker (ParticleAnalyser applied to multiple frames)
- Three mices in Open Field



### Results





#### **Easy Situation – Simple Tracking Successful**



#### **Simple Connected Components Analysis Failures**







Combine dynamic and observation models
 Kalman - Linear and Gaussian
 Particle Filter - Less restrictive



PDF of Random State Variable = Weighted Samples (Non-parametric)



### **Particle Filters**











Observation

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Weighting

Correction







- Animal tracking interesting challenges
- Very simple techniques don't work
- Work in progress Predictive filters applied to animal tracking
- Free-software based implementation
- Results will be incorporated by the SIGUS project: ML+DIP for Vision Based HCI
- Project Website (in Portuguese): www.gpec.ucdb.br/topolino