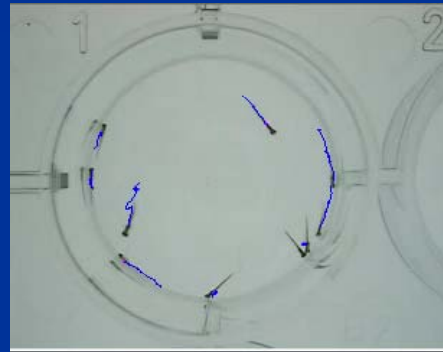# 動物影像擷取分析系統
Clever System
GroupScan &SocialScan
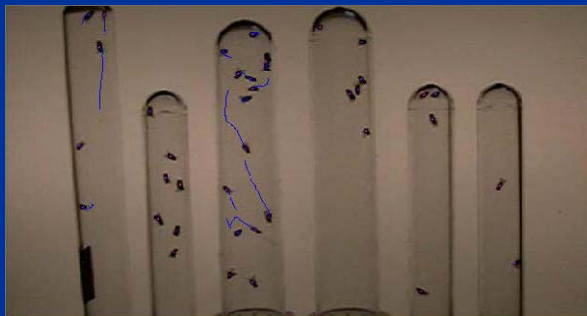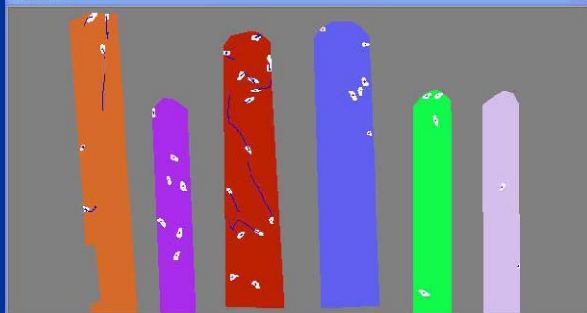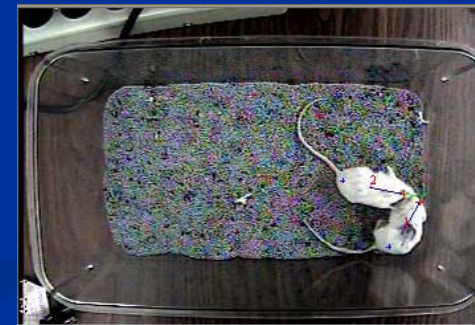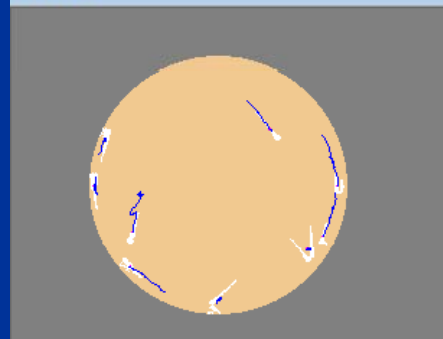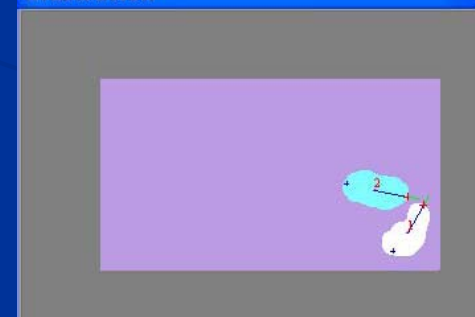
三典科技 李巧芸

2008/05/14

Outline

- 硬體需求
- 影像分析
- 操作步驟
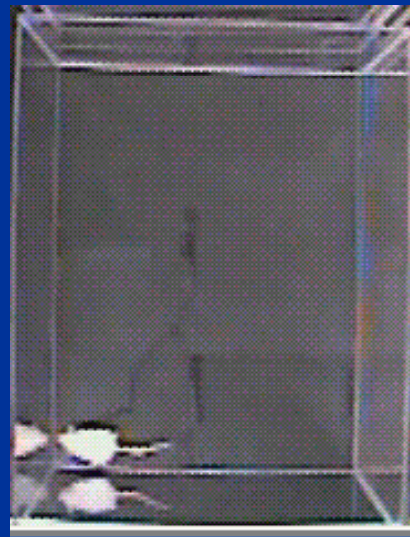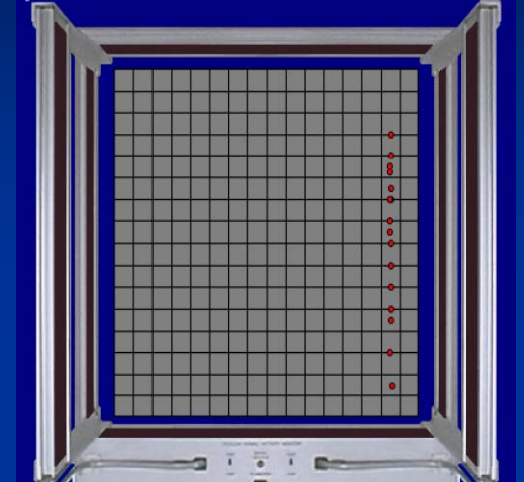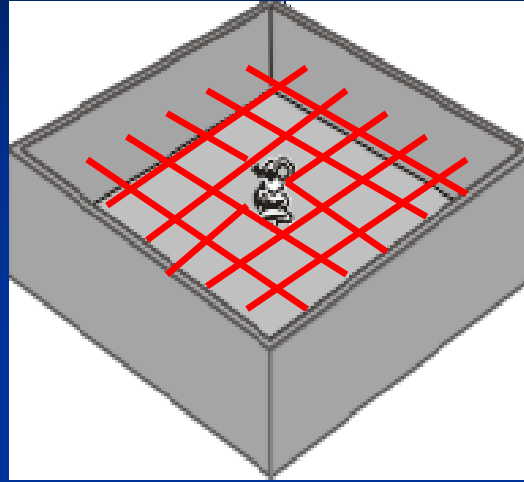 - GroupScan
  - SocialScan
- 檔案管理

硬體需求

- 攝影機
  - 影像擷取: DV or CCD camera
  - 影片格式: MPEG file
  - 解析度: 352*240 or 640*480
  - 攝像率: 30 frames/sec NTSC
- 電腦
  - MS Windows XP或MS Windows 2000
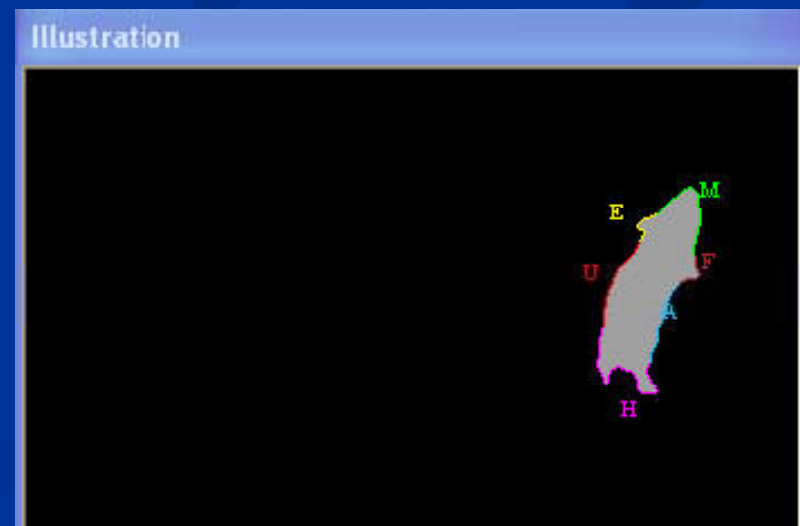 - CPU: Pentium 4 Processor以上
  - RAM: 1GB以上
  - HD: 80G以上

影像分析

Photo-beams

↓

Video tracking

↓

Behavior recognition

Clever: Video tracking + Behavior recognition
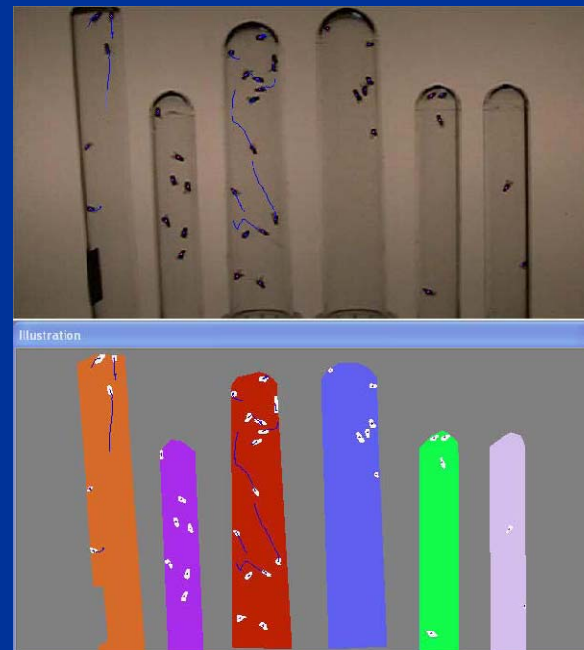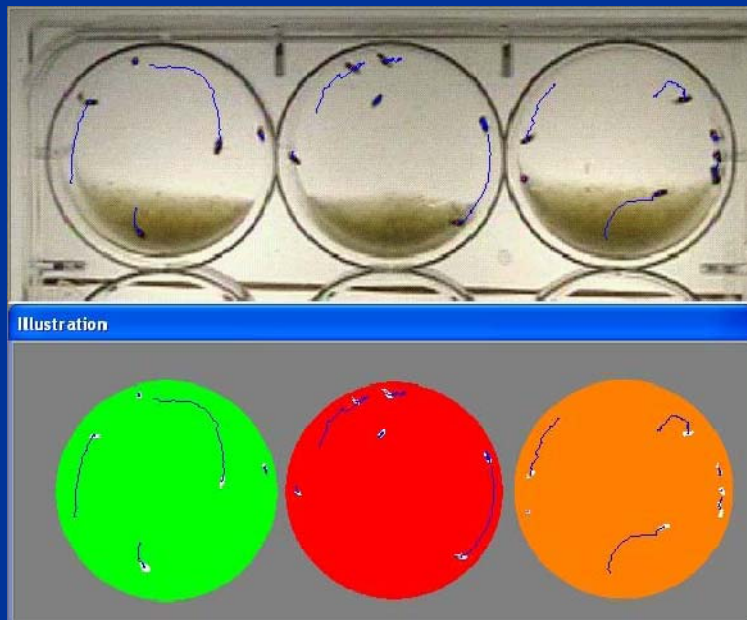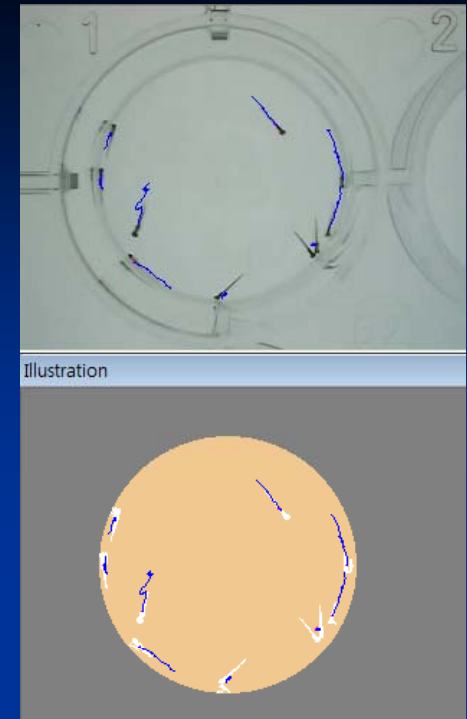
Clever system

- Video tracking + Behavior Recognition
  - **full body (shape, color)**
  - **body parts (head, tail, forelimbs, hind limbs, abdomen, upper/lower back, ear, etc.)**
- Color form, without body marking

GroupScan

- Options:
  - Basic
  - Real-time
  - High-throughput
    [6 tubes, 96 cell with 1 animal/arena]
  - RH

GroupScan

- 分析一群動物在一個區域中的平均行為
- Ex. 果蠅, 蜜蜂, 斑馬魚, 大/小鼠…

	傳統可測得參數	新增參數
GroupScan 群體行為偵測套組	N/A	可以測得下列參數： ●可清楚看見動物的最大數量 (MaxVisibCount)、 ●目前可清楚看見動物的數量 (CurVisibCount)、 ●分析過程中活動動物的最大數量 (MaxLiveCount)、 ●目前活動動物的數量(CurLiveCoun ●平均速度(Total AvSpeed)、 ● 活動動物的平均速度(Active AvSpeed)。

GroupScan軟體操作步驟
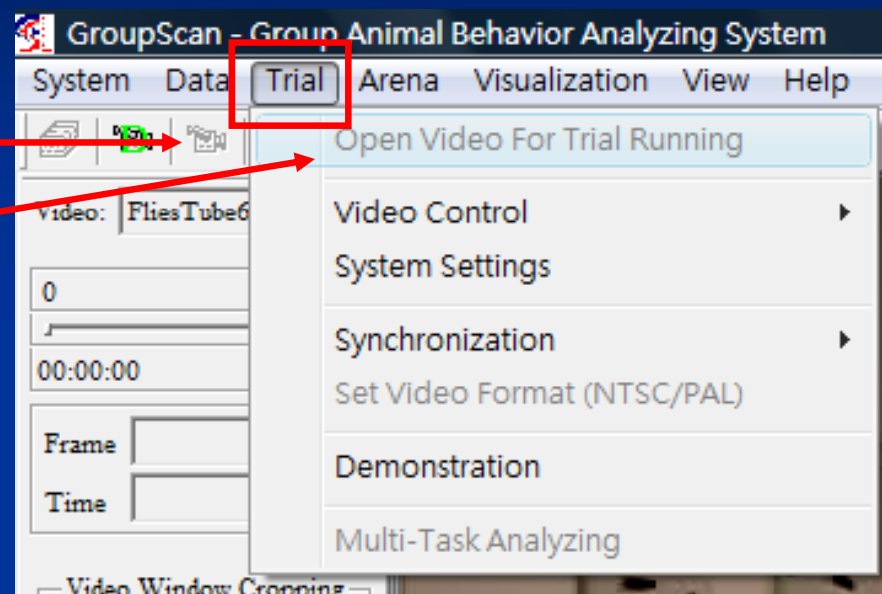
1. 選擇要分析的影像檔案

⇓

2. 設定實驗區(Arena)數目

⇓

3. 設定實驗區(Arena)範圍、區塊(Zone)範圍、面積區域(Area)命名、及距離校正

⇓

4. 設定事件(Event)準則及偵測分析準則

⇓

5. 開始影像分析

⇓

6. 結果儲存&輸出

⇓

7. 結果視算
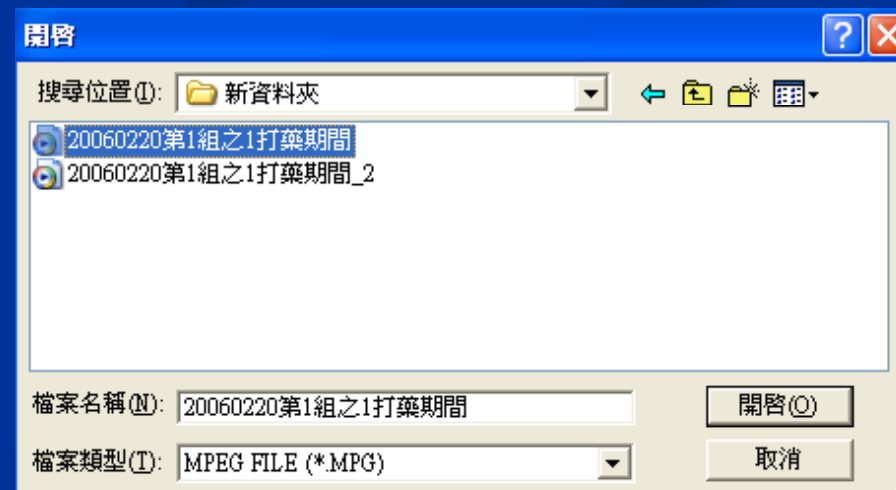
軟體操作介面

1. 選擇要分析的影像

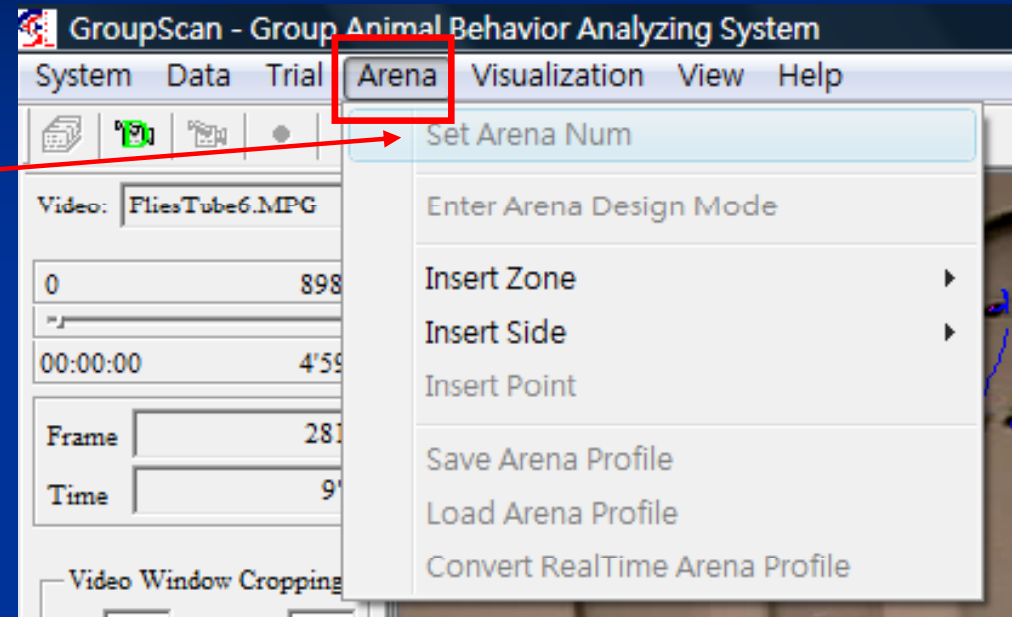■ 兩種方式將影片開啟:
1.
2. "Open Video For Trial Running"

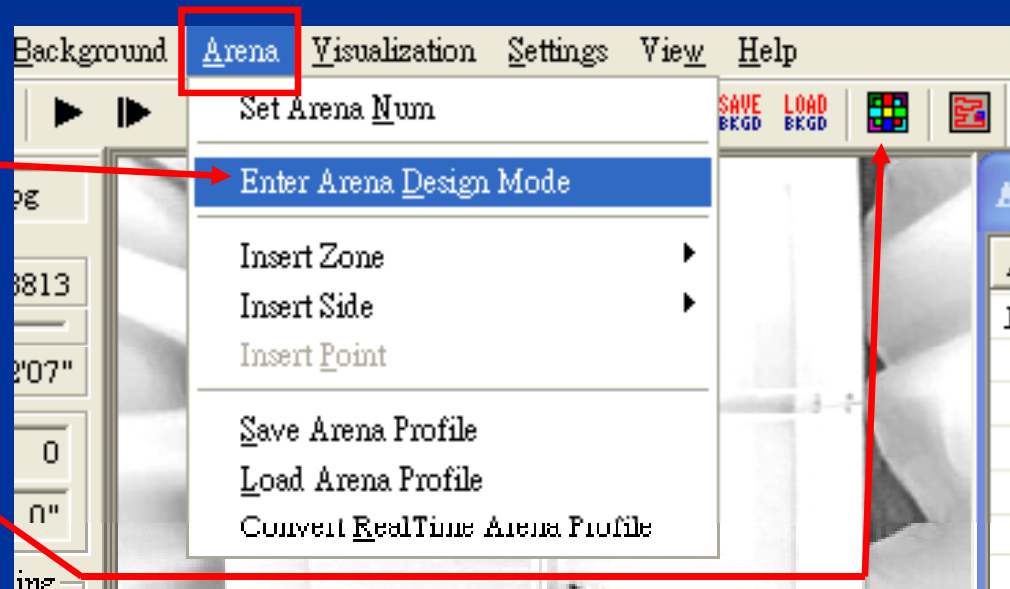■ 選擇要分析的影片檔並開啟

2. 設定實驗區(Arena)數目
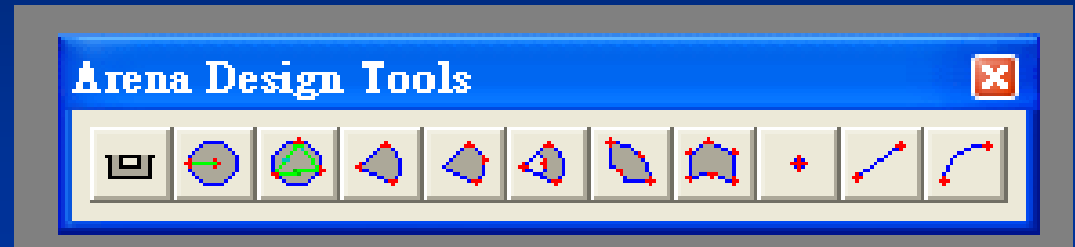

■ "Set Arena Num"

■ 輸入實驗區數目

3-1. 設定實驗區(Arena)及區塊(Zone)範圍
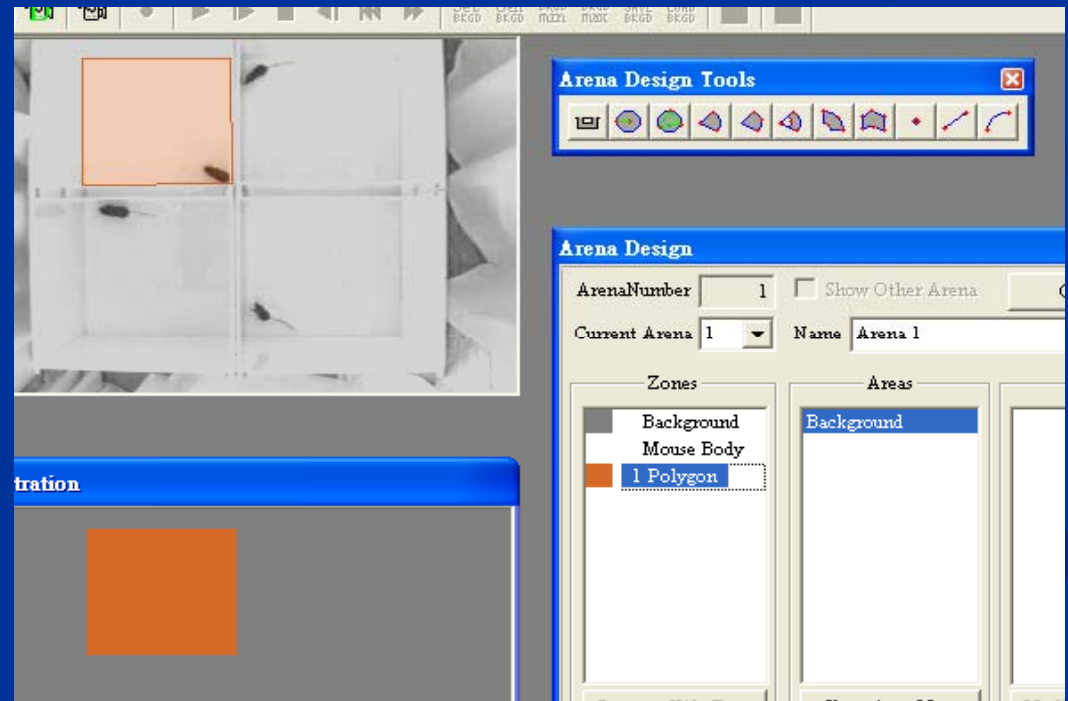
- ”Enter Arena Design Mode”或
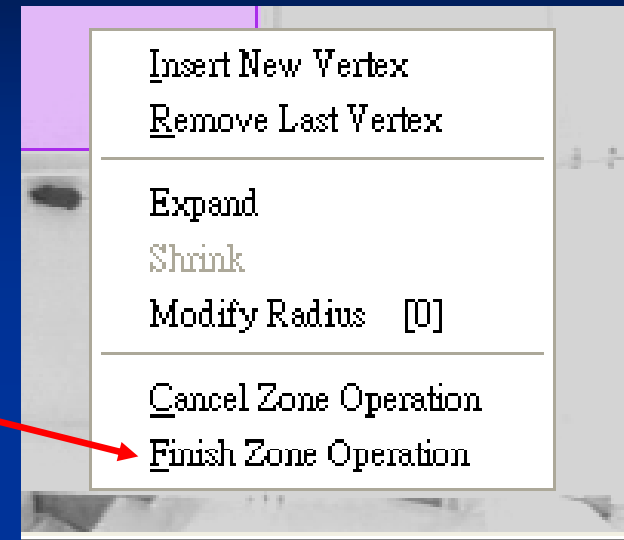
3-1. 設定實驗區(Arena)及區塊(Zone)範圍

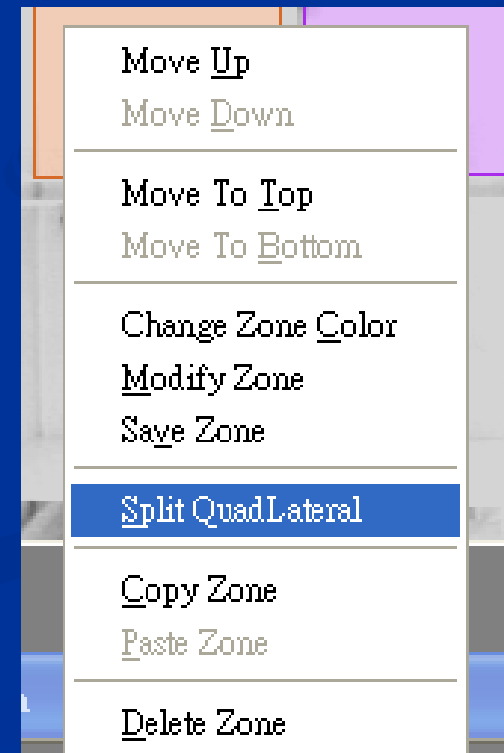- 依實驗區形狀選擇工具

- Ex. 選擇Polygon( )鍵來點選實驗區的範圍
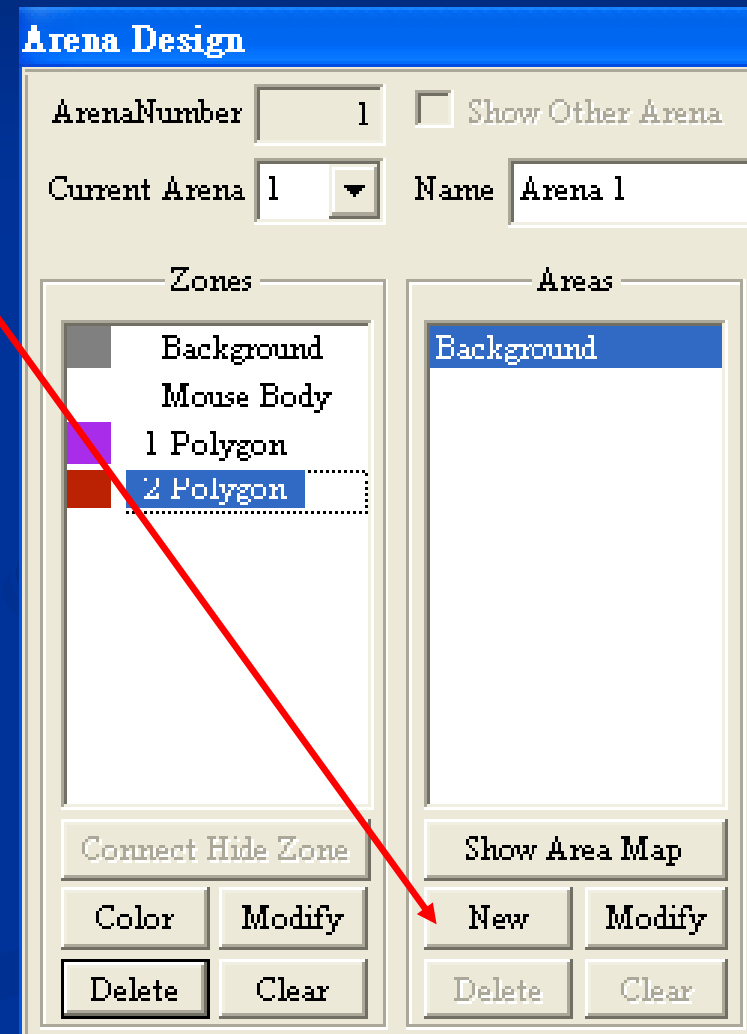
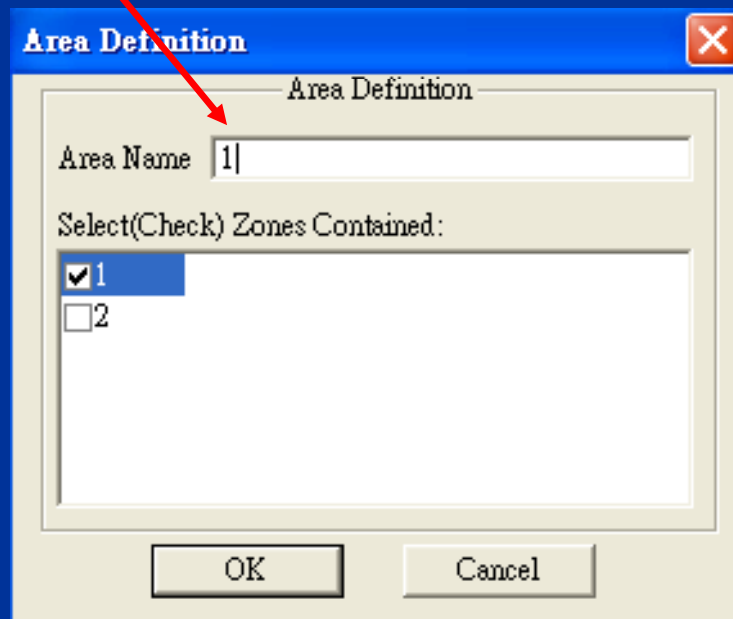# 3-1. 設定實驗區(Arena)及區塊(Zone)範圍

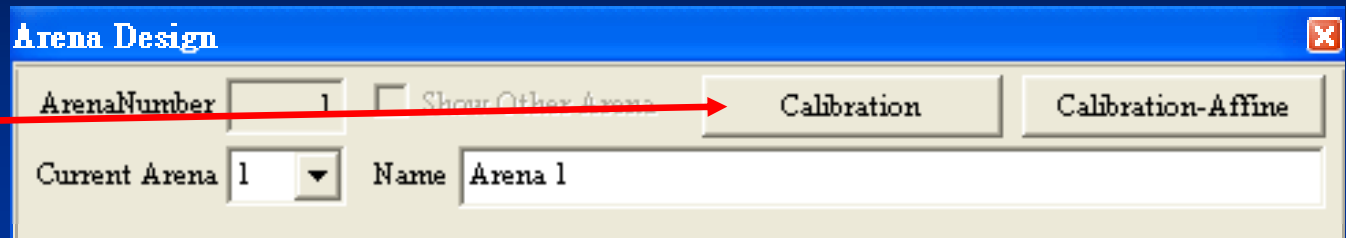- 按滑鼠右鍵，點選 "Finish Zone Operation"

- 再按一次右鍵出現之選項
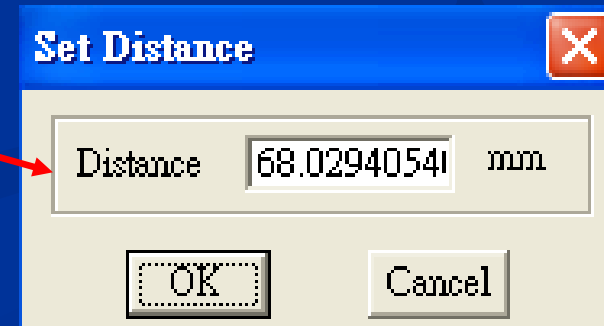
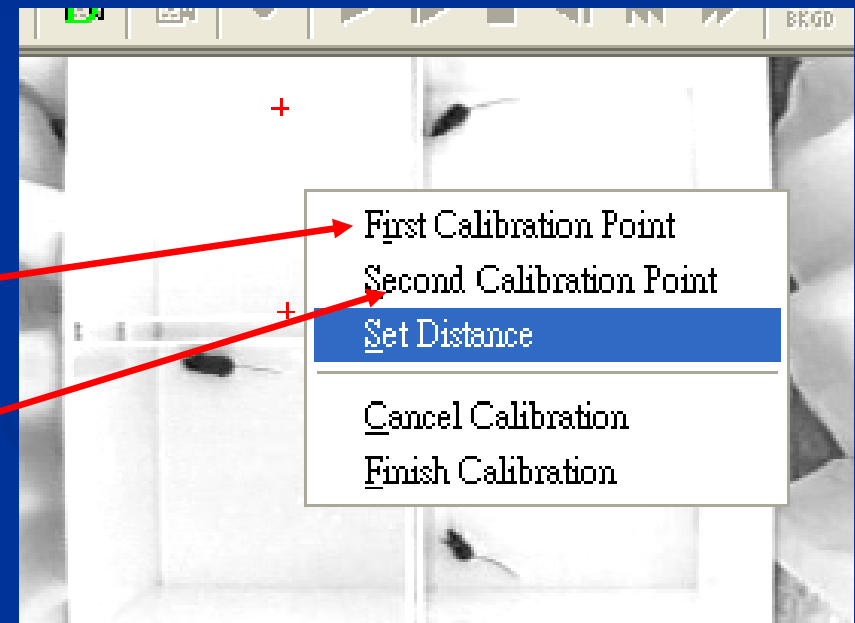# 3-2. 面積區域(Area)命名

■ 點選Areas欄位的”New”，
勾選要命名的區塊號碼，並
輸入名稱

Area Definition

Area Definition

Area Name 1

Select(Check) Zones Contained:

☑ 1
☐ 2

OK   Cancel

Arena Design

ArenaNumber   1   ☐ Show Other Arena

Current Arena 1 ▼   Name Arena 1

Zones

Background
Mouse Body
1 Polygon
2 Polygon

Areas

Background

Connect Hide Zone   Show Area Map

Color   Modify   New   Modify

Delete   Clear   Delete   Clear

3-3. 距離校正(Calibration)

- "Calibration"

Arena Design

ArenaNumber   1   ☐ Show Other Arena   Calibration   Calibration-Affine

Current Arena   1 ▼   Name   Arena 1

- 起始點按右鍵，點 "First Calibration Point"

- 終點按右鍵，點 "Second Calibration Point"

- 再按右鍵，點 "Set Distance"，輸入兩點實際的距離

First Calibration Point
Second Calibration Point
Set Distance

Cancel Calibration
Finish Calibration

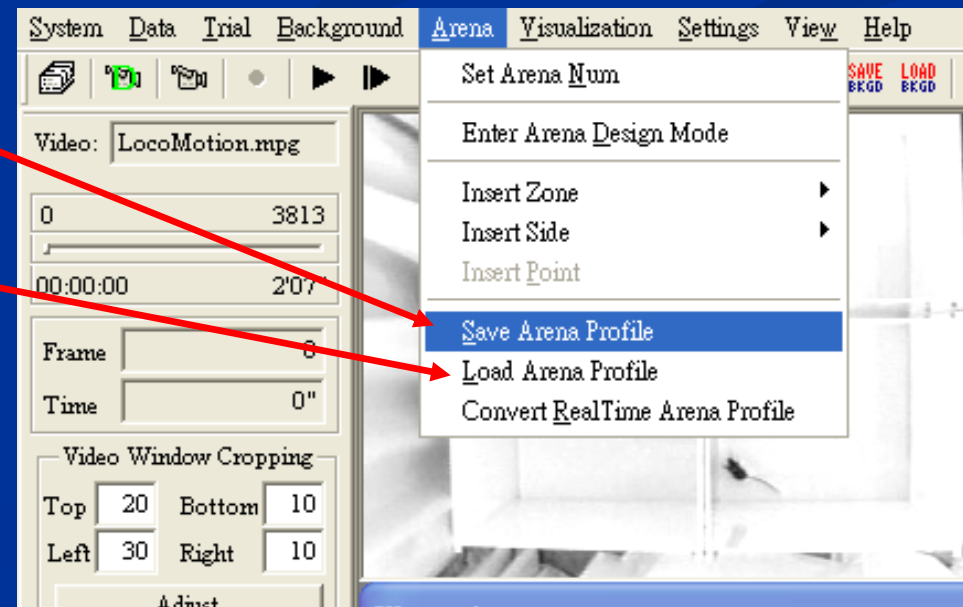**Set Distance**

Distance   68.0294054   mm

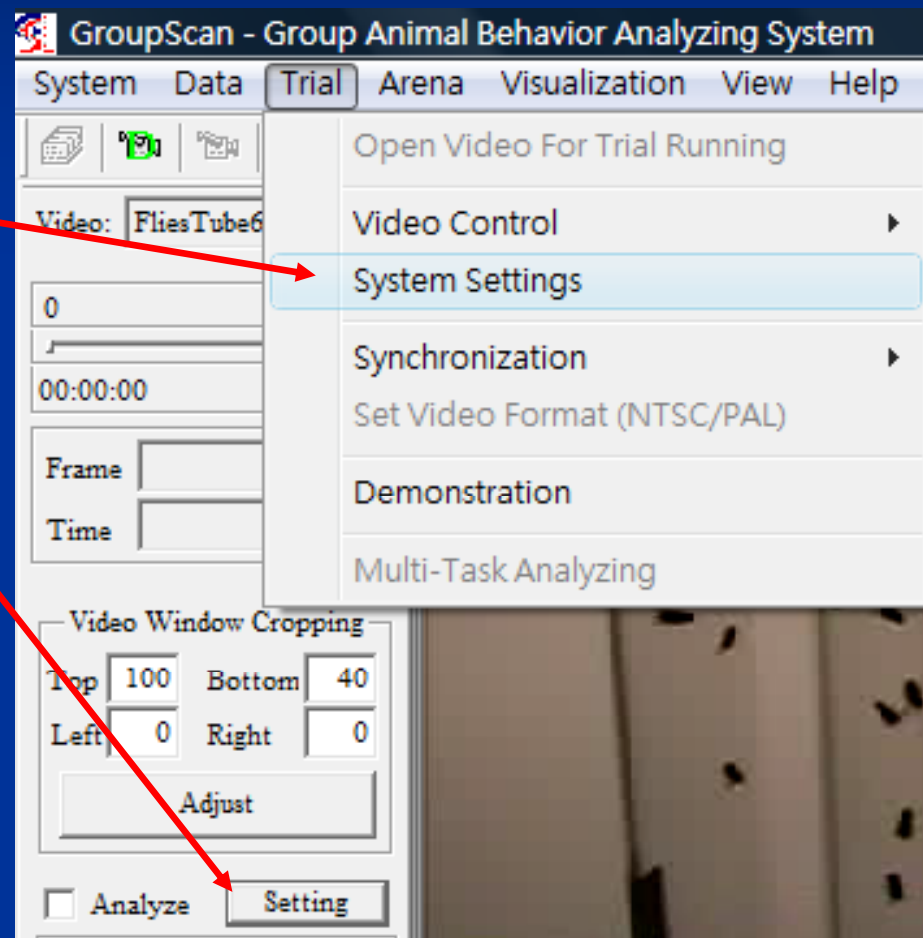OK   Cancel

3-4. 實驗區設定完成&儲存

- 設定完成，
點"Finish"
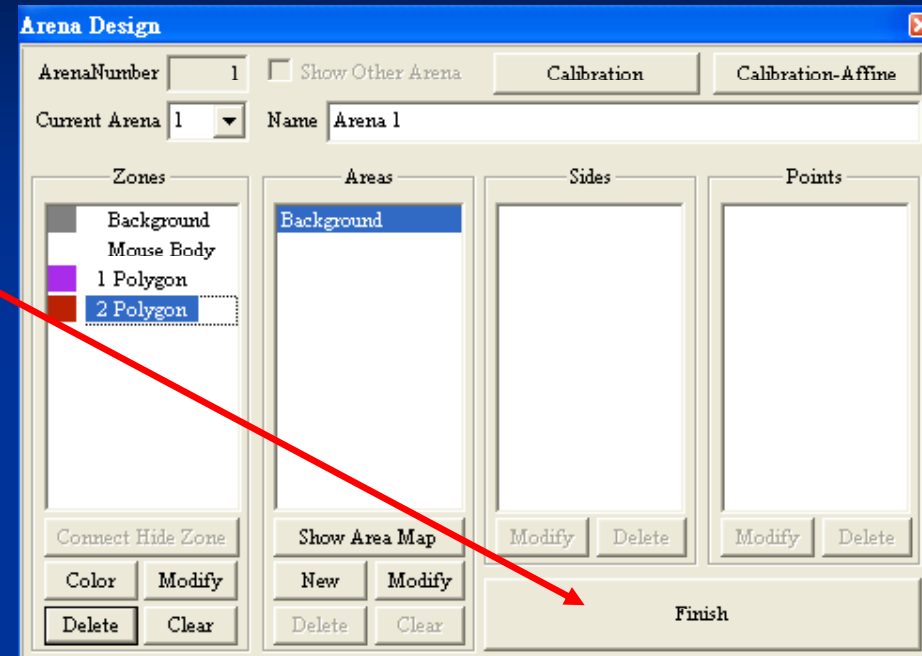
- "Save Arena Profile": 實驗區設定存成.GCG檔案
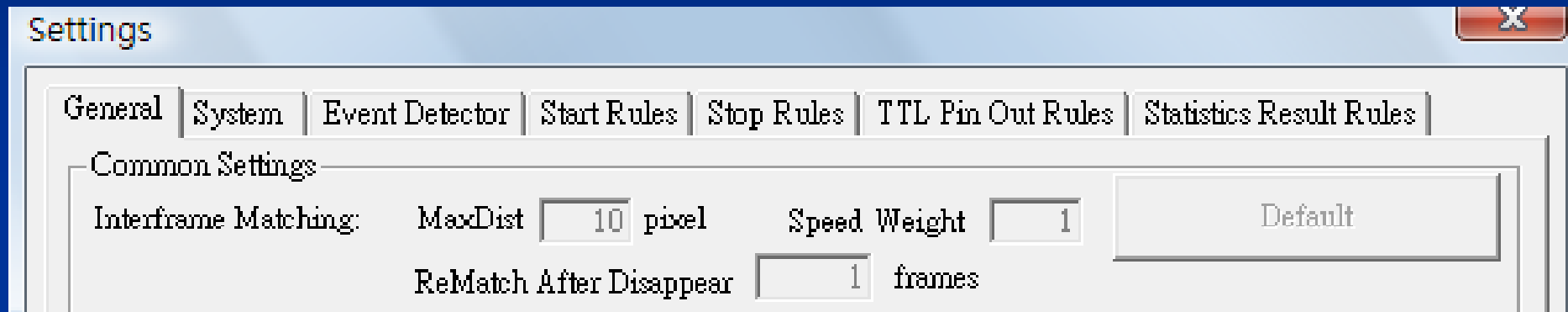- "Load Arena Profile": 檔案輸入

4. 設定事件(Event)準則及偵測分析準則

- ”System Settings”

4-1. System Settings-Common Settings

1. Interframe matching:

- MaxDist:

- Speed Weight (w):

- ReMatch after Disappear:

4-1. System Settings-Common Settings

Active Motion	30	Frame Motion >	4 mm	Seperate Threshold (pix): 4
Speed Calculation:	Frame Disp:	30		
Estimation	○ Dead Zone	⊙ Same	○ Ratio	0
Live	Active Value >	1	Active Value Decrease	0.005 every frame

2. Active Motion:

- 30 Frames Motion > 4mm:

- Separate Threshold:

3. Speed Calculation:

Active Motion		30	Frame Motion >	4	mm	Seperate Threshold (pix):	4
Speed Calculation:		Frame Disp:	30				
Estimation		○ Dead Zone	⊙ Same	○ Ratio	0		
Live		Active Value >	1		Active Value Decrease	0.005	every frame

4. Estimation:

- Dead Zone:

- Same:

- Ratio:
  -Ratio = 0 →"Dead Zone" mode;
  -Ratio = 1 →"Same" mode.

5. Live:

4-1. System Settings-Arena Specific Settings

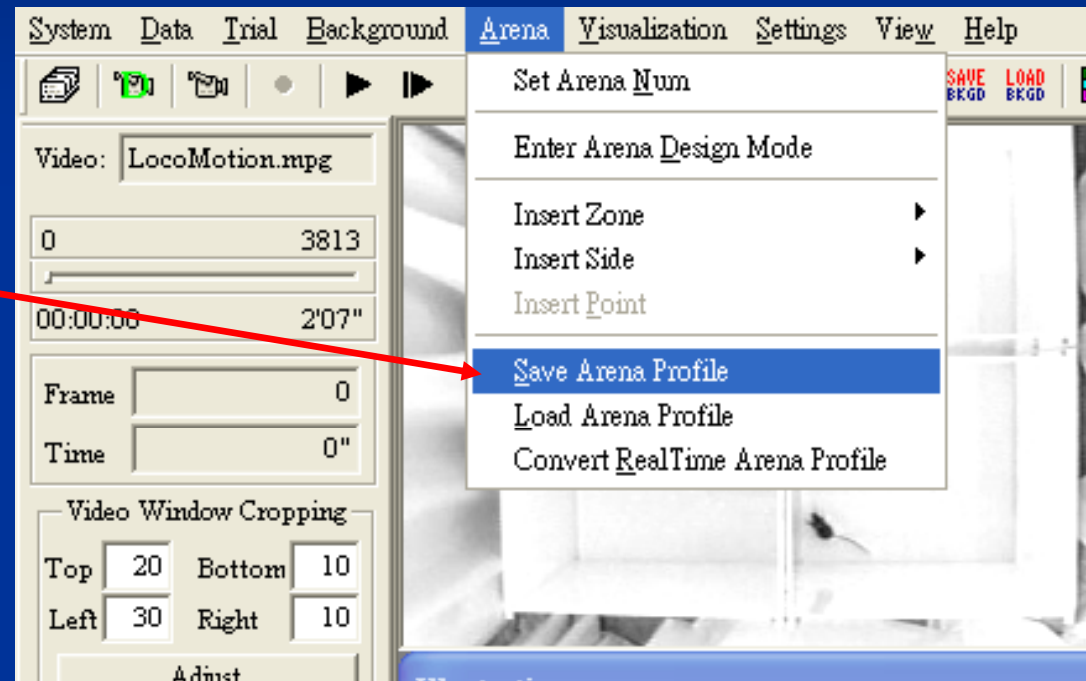6. Gray Level Threshold:

7. Set Animal Number: 設定每一區域的動物數目.

4-2. Start Rules &Stop Rules
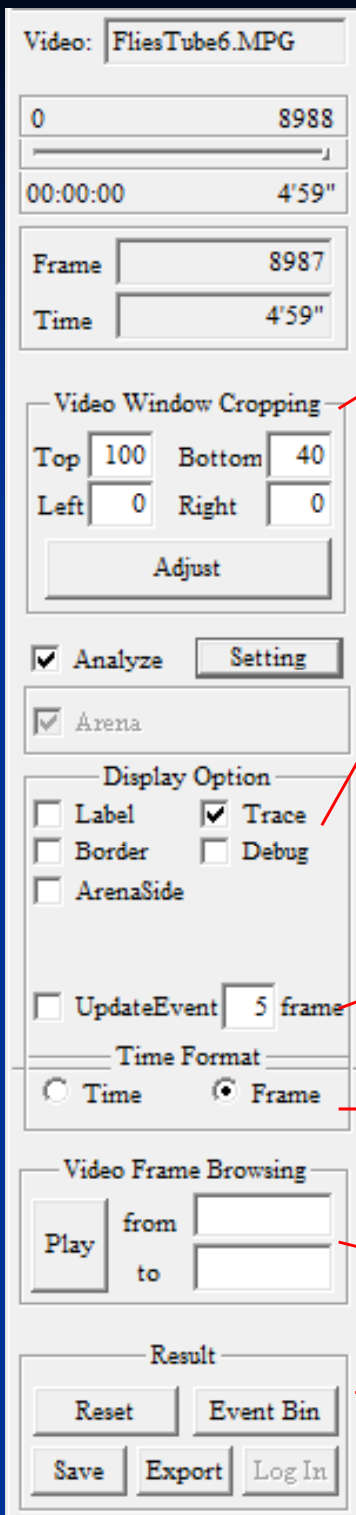
- Start Rules: At Time
- Stop Rules: At Time or Duration
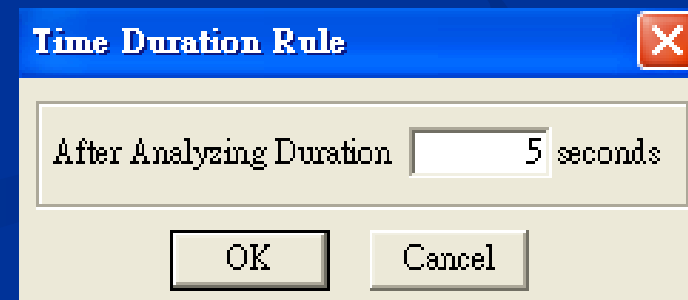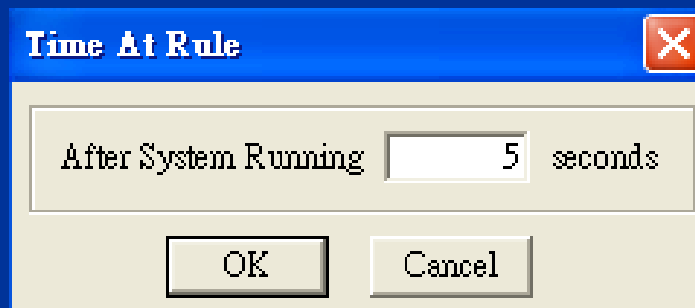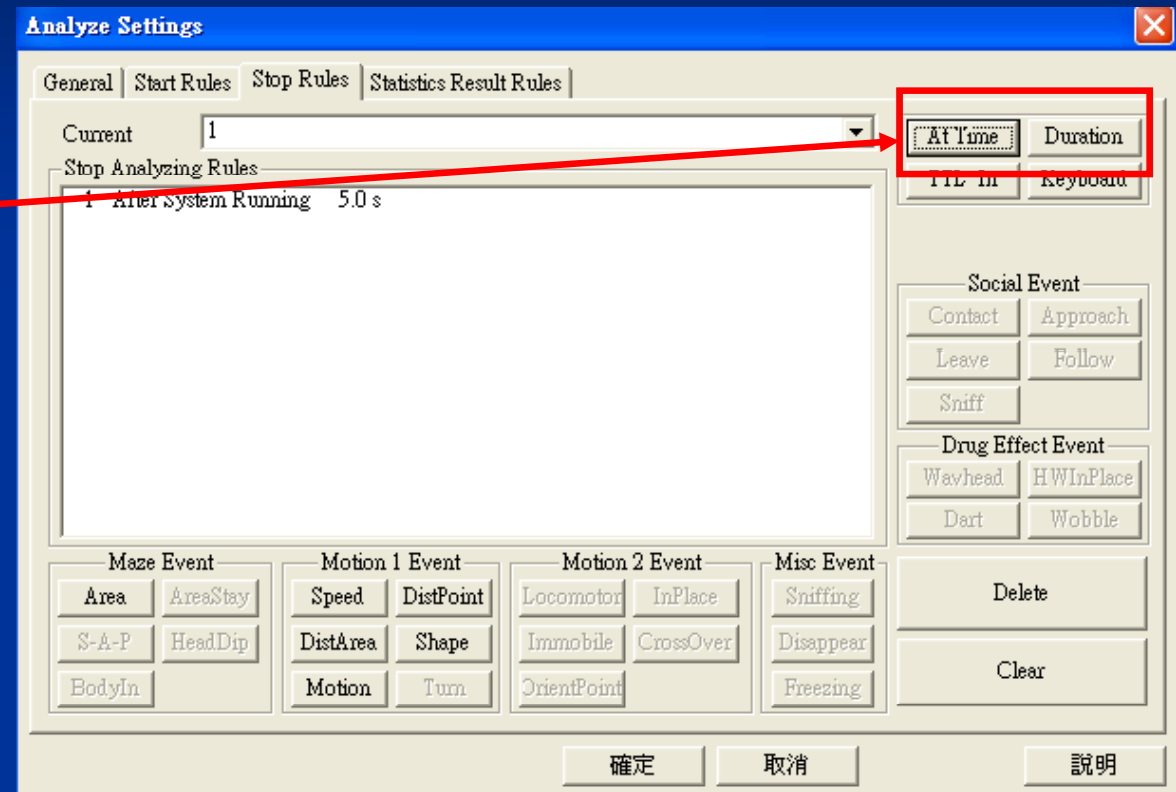
4-3. 儲存事件統計準則設定

- ”Save Arena Profile”: 將所有設定儲存成.GCG檔案，和實驗區設定存成同一個檔案。

5. 影像分析

Video: FliesTube6.MPG

0   8988

00:00:00   4'59"

Frame   8987
Time   4'59"

Video Window Cropping
Top 100   Bottom 40
Left 0   Right 0
Adjust

☑ Analyze   Setting
☑ Arena

Display Option
☐ Label   ☑ Trace
☐ Border   ☐ Debug
☐ ArenaSide

☐ UpdateEvent 5 frame

Time Format
○ Time   ● Frame

Video Frame Browsing
Play   from
to

Result
Reset   Event Bin
Save   Export   Log In

調整視窗中動態影像要觀察的位置

勾選標示:
Label:標示出動物的標號及動物重心位置
Trace:移動軌跡
Border:標示區塊邊緣
Debug:除錯功能
Arena Side:實驗區範圍邊緣標示

事件及其他顯示是否要即時呈現

時間形式

跳至設定範圍內的畫面進行播放

將結果儲存、輸入、輸出及將依屬性做歸納

開始分析

- 勾選 "Analyze"，按下Play ▶)鍵開始分析
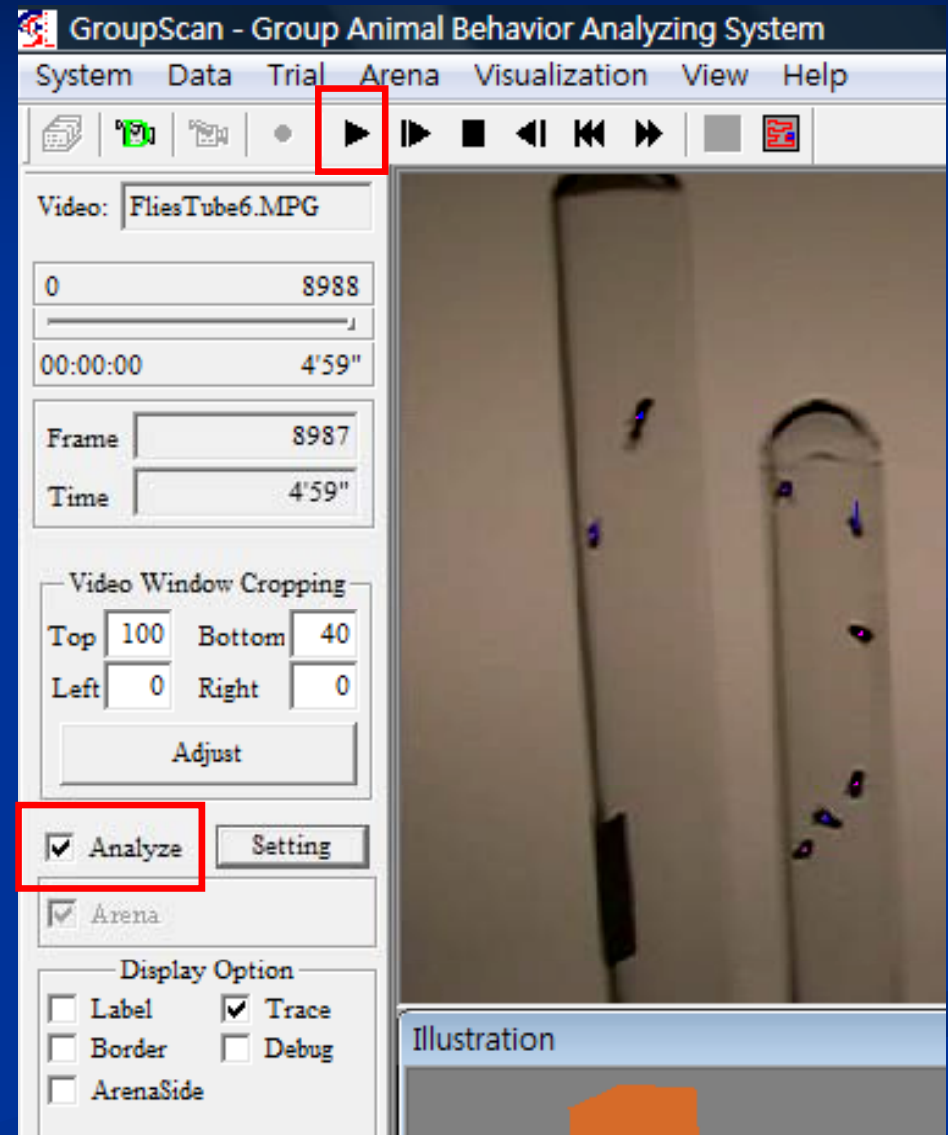
分析結果

6-1. 結果儲存 (Result Save)

- "Save": 將分析結果依各實驗區儲存成.TCR, .EVT, .SPD, .LIV檔
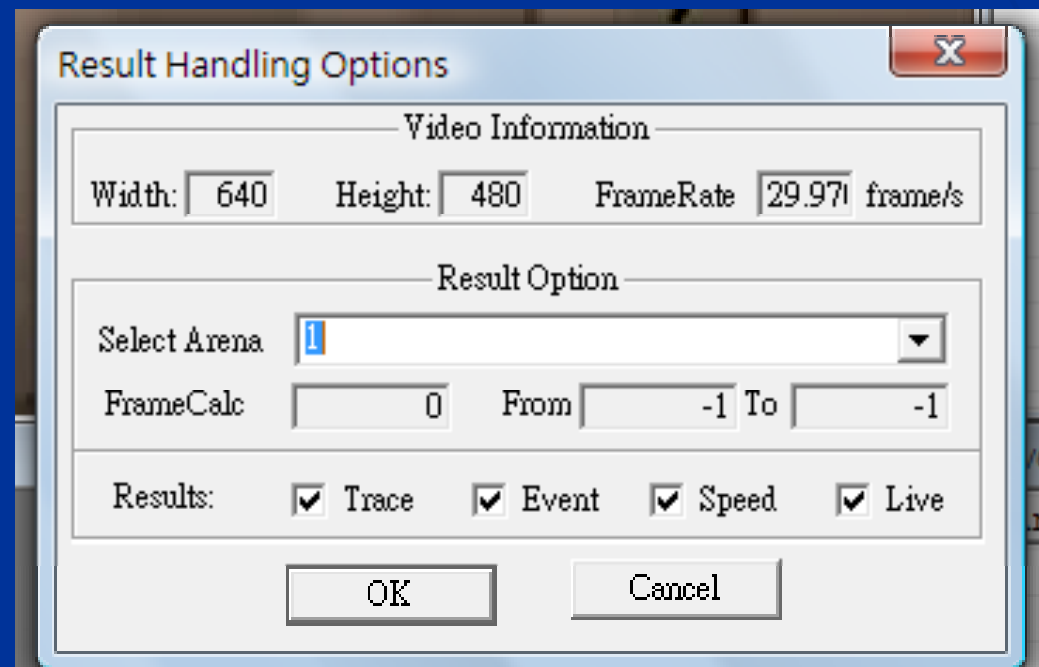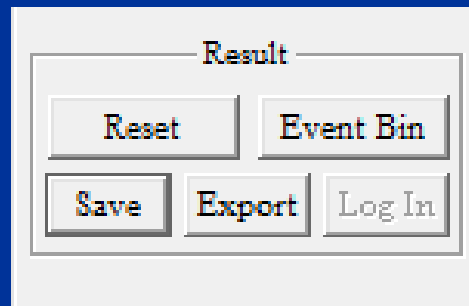
6-2. 結果輸出 (Result Export)

- ■ "Export":自動分區輸出成Excel檔
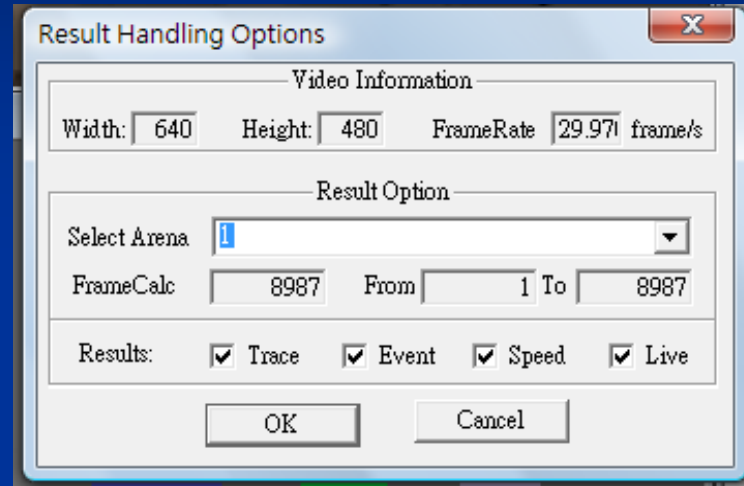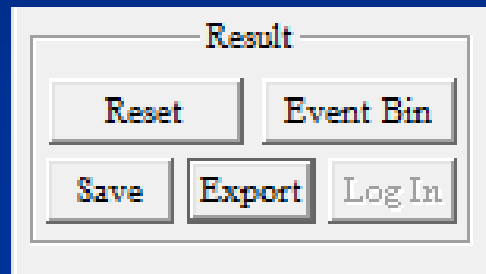
	A	B	C	D	E	F	G	H	I	J	K
1	Statistics Result of Arena 1										
2	ID	From(Frame)	To(Frame)	Duration(Frame)	MaxVisibleCoun	CurVisibleCount	MaxLiveCoun	CurLiveCoun	CurStaticCount	Total AvgSpeed	Active AvgSpeed
3	1	1	8987	8986	5	2	5	2	0	0.37	4.12
4											

	Export of Live Event							
	Arena	From(Frame)	To(Frame)	Duration(Frame)	Live Count	Total Avg. Speed	Active Avg. Speed	Travel Dist.
	1	2	4159	4157	5	3.79	12.22	525.75
	1	4159	8791	4632	4	1.2	10.35	184.97
	1	8791	8814	23	3	0.65	5.6	0.5
	1	8814	8987	173	2	0.52	4.73	2.97

7. 結果視算(Result Visualization)

- Visualization的 "Result Visualization"，或

- 選擇欲分析之區域

7. 結果視算(Result Visualization)
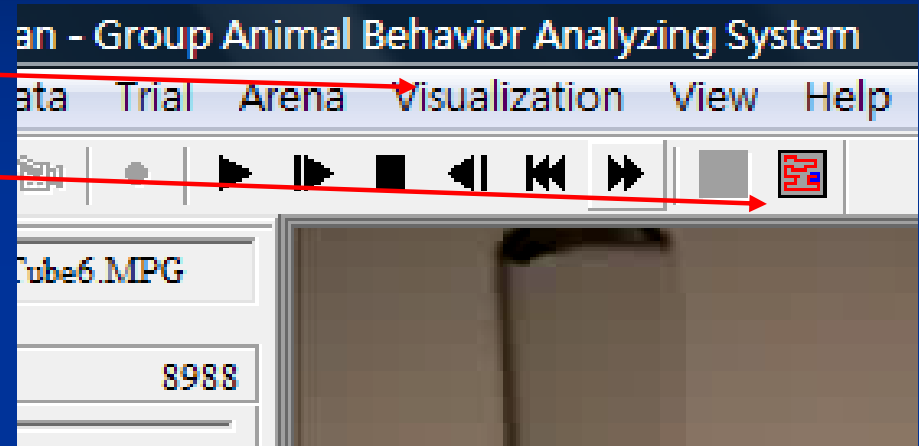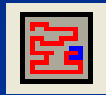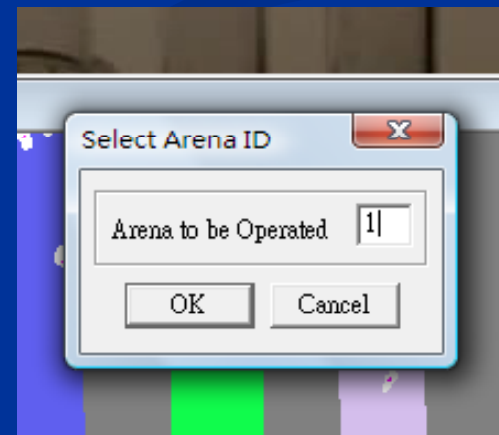
測量值輸出

- **Seq:** 測量項目輸出

- **Value:** 測量數值即時計算

- **Hist:** 圖表輸出

Seq: 輸入間隔時間及項目

Value: 選擇項目後按Calculate可即時計算出數值
Hist: 圖表輸出

SocialScan

- Options:
  - B
  - R
  - H [4 arenas, 4 animals/arena]
  - RH

Illustration

	傳統可測得參數	新增參數
SocialScan 社交行為偵 測套組	兩隻用顏色標定的動物，以其質量重心測得兩隻動物間的距離	不需用顏色標明，兩隻動物只需有些微的顏色或對比差異，即可依其相互移動及位置測得下例參數： •Approach 互相靠近 •Avoidance 互相躲避 •Contact 互相接觸 •Sniffing 互相嗅聞

Social Scan軟體操作步驟

1. 選擇要分析的影像檔案
⇓
2. 設定背景、產生背景或合成背景，以及輸入背景
⇓
3. 設定實驗區(Arena)數目
⇓
4. 設定實驗區(Arena)範圍、區塊(Zone)範圍、面積區域(Area)命名、及距離校正
⇓
5. 設定事件(Event)準則及偵測分析準則
⇓
6. 開始影像分析
⇓
7. 結果儲存&輸出
⇓
8. 結果儲存&輸出

2. 設定背景、產生背景、合成背景及輸入背景

- **Set Frame As Background:**
  以空的片段為背景

- **Generate Background:**
  由有動物的片段產生背景

- **Load Background:**
  載入背景
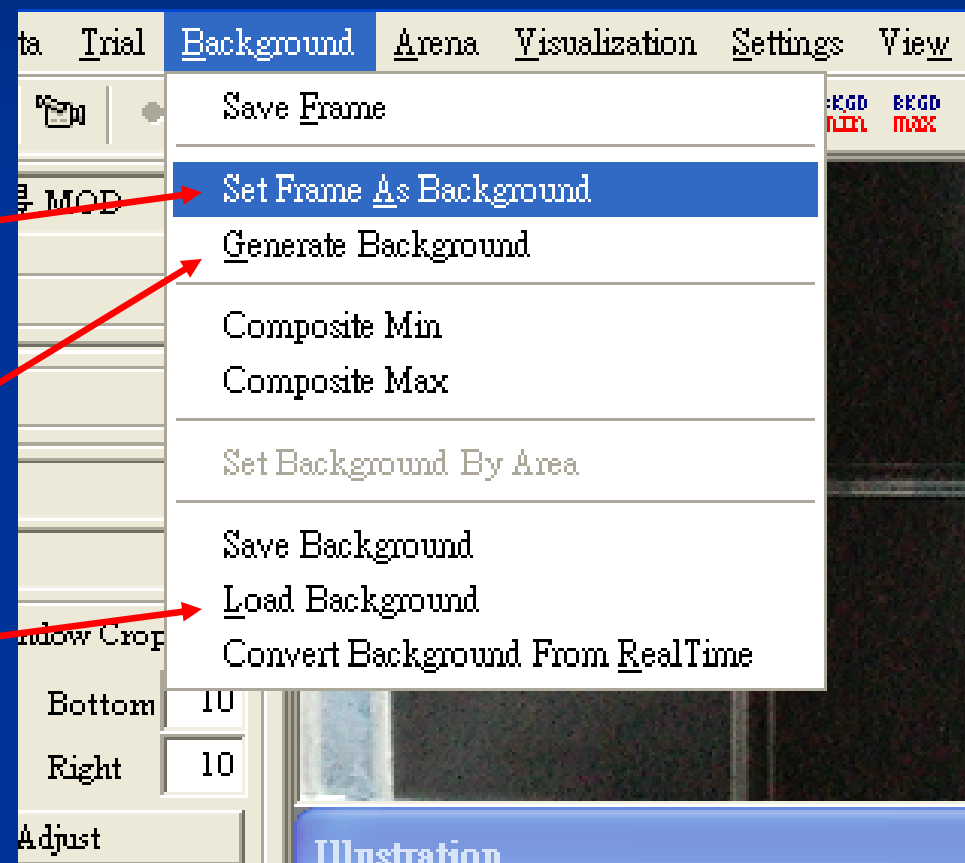
5-1. 設定事件(Event)準則及偵測分析準則

- "Animal Detection and Tracking Settings"
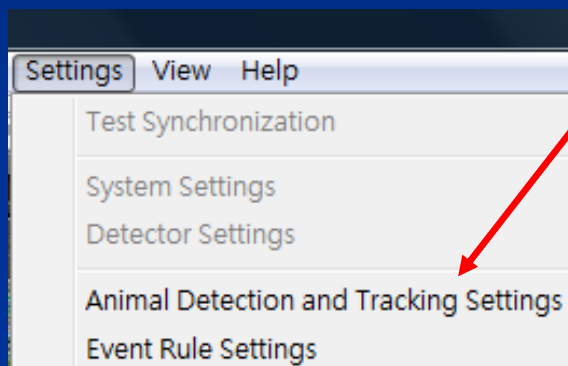
5-2. 設定事件(Event)準則及偵測分析準則

■ "Event Rule Settings"
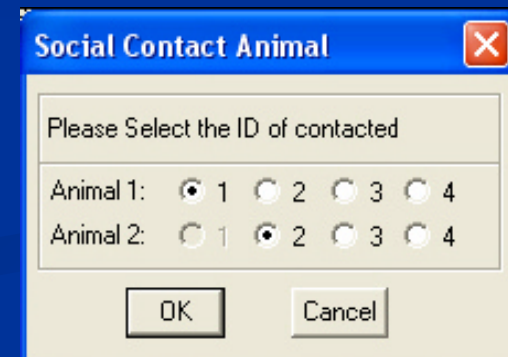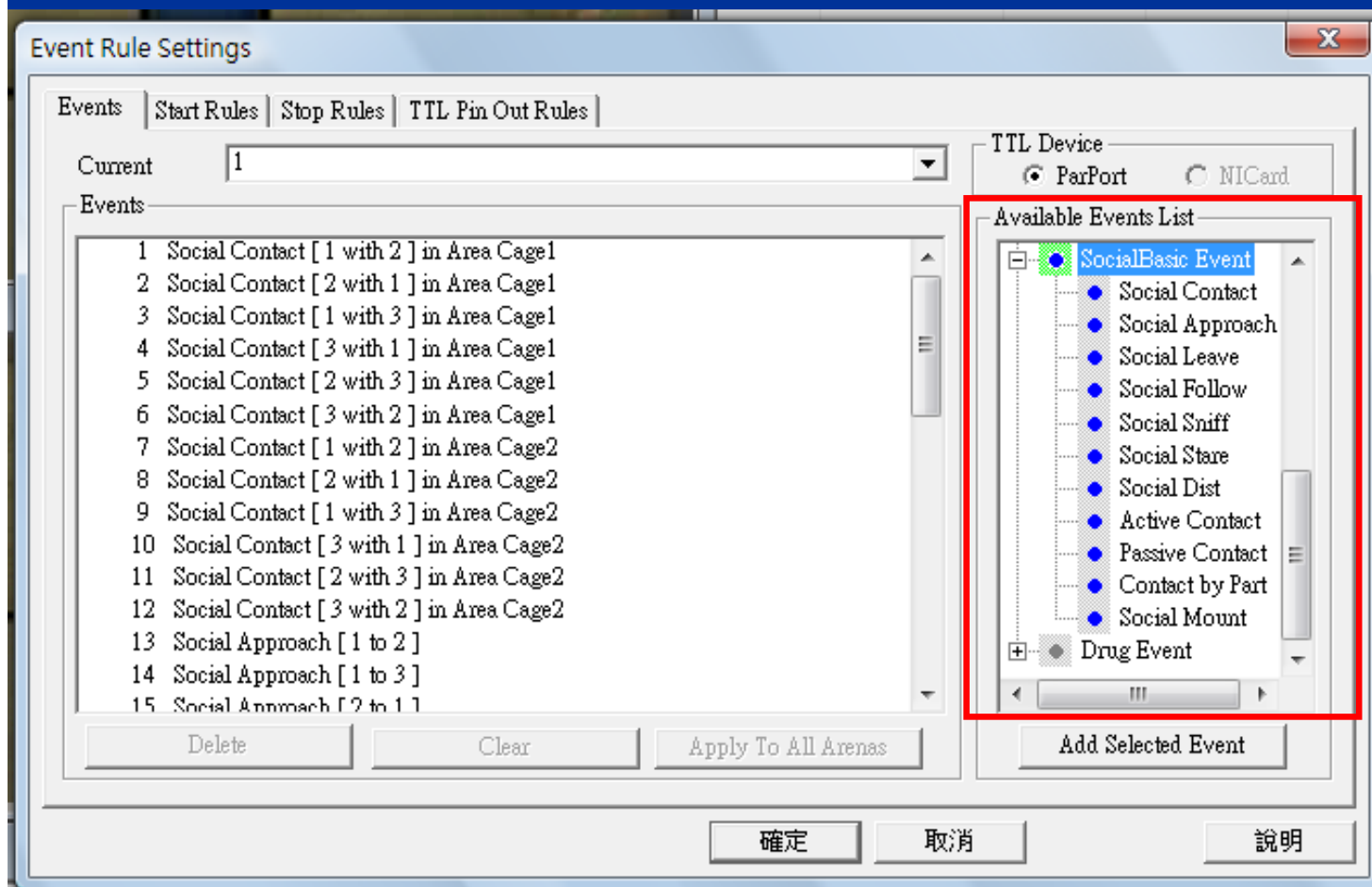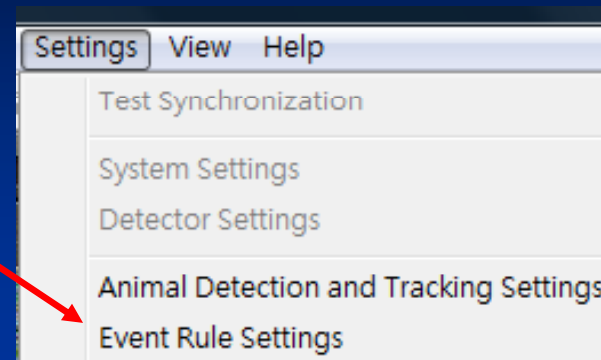
[1,2]=[2,1]
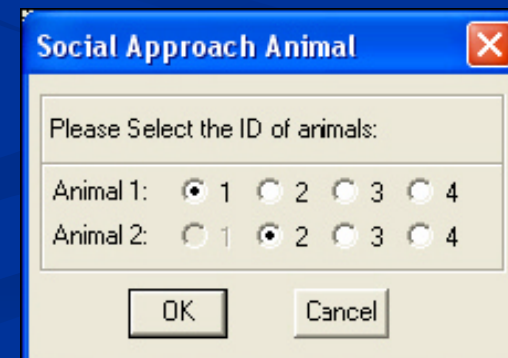
[1,2] ≠[2,1]

5-3. 設定事件(Event)準則及偵測分析準則

■ "Detector Settings"   →

Settings   View   Help

Test Synchronization

System Settings
Detector Settings

Animal Detection and Tracking Settings

Event Rule Settings

Detector Settings

| Non-Social Detector (1) | Non-Social Detector (2) | Non-Social Detector (3) |

| Non-Social Detector (4) | Social Detector (1) | Social Detector (2) | Social Detector (3) | Drug Abuse Detector |

Save   Load   Default

Max Animal   3   Content Update Factor   0.99   VerifyLer   15   EdgeDist Th   1

Shape Memory Length: 5   frames   De-noise Iters   4   ☑ Animals with Uniform Color

☐ Social Recognition   ☐ Segment Animals in Contact   ☑ Animal with Marks   ☑ Animals of Similar Size

Ex. Approach Detection

- Dist:

- Angle:

- Move:

- Sequence:

分析結果

資料管理模式 (Data management mode)

- 點選 或由Data→Enter Data Management Mode
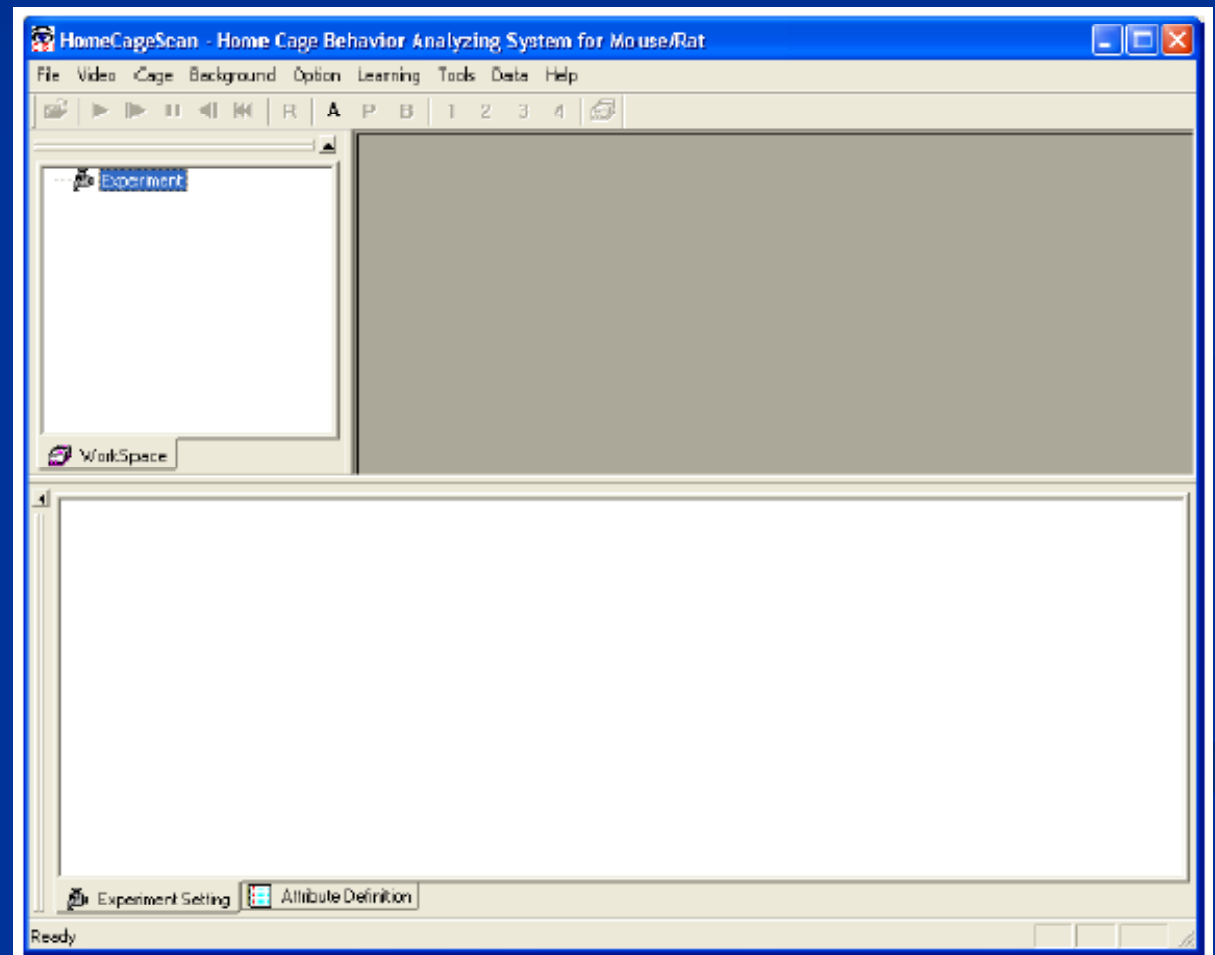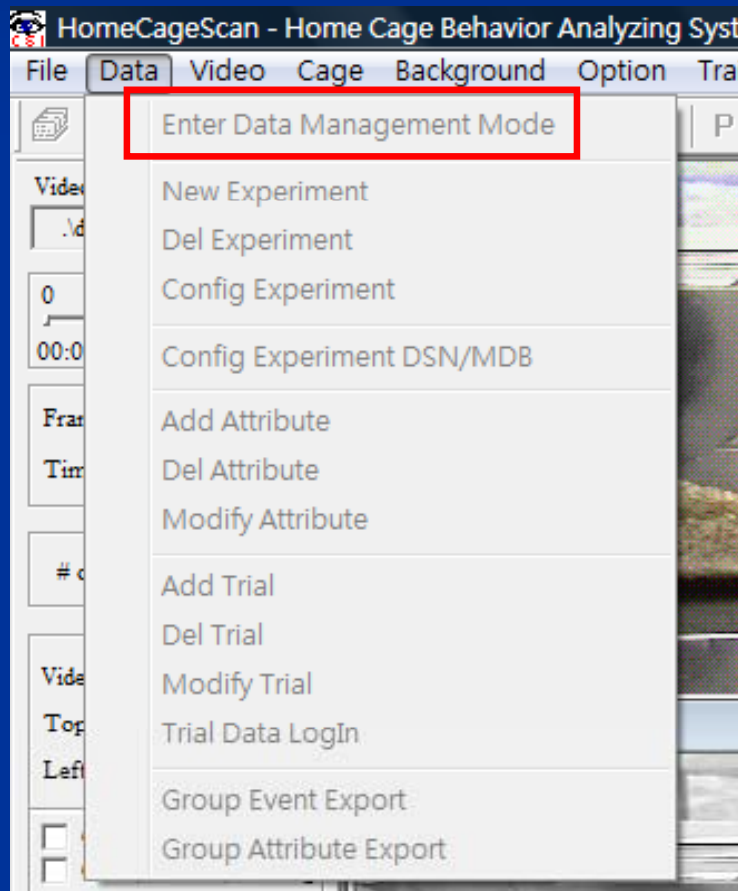
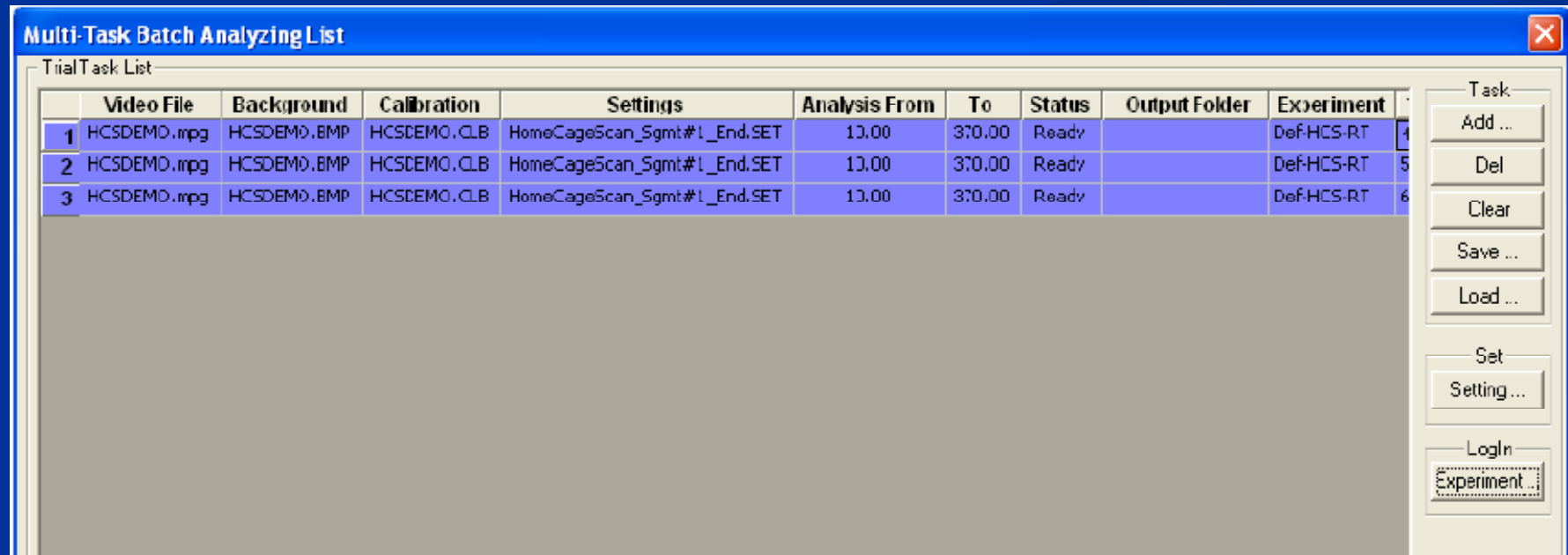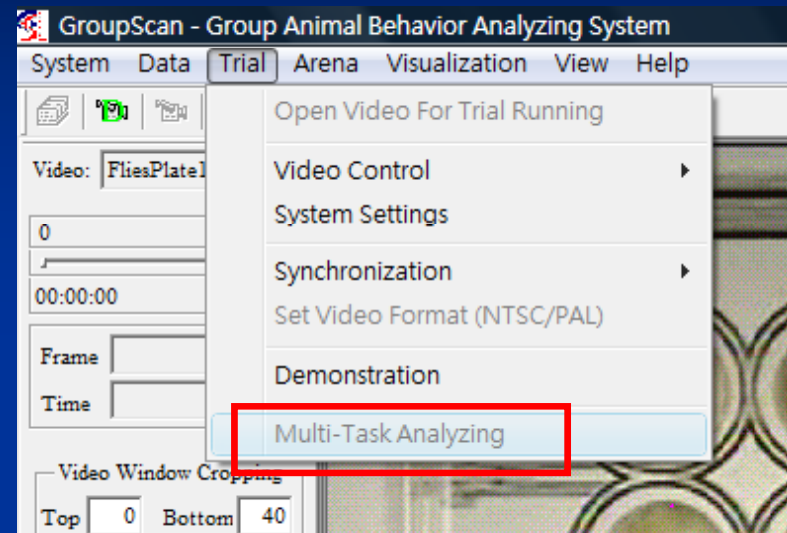# 整組事件輸出(Group Event Export)

- 在試驗分析之後將多組結果輸出為一個Excel檔。

- 選擇輸出的試驗和項目。
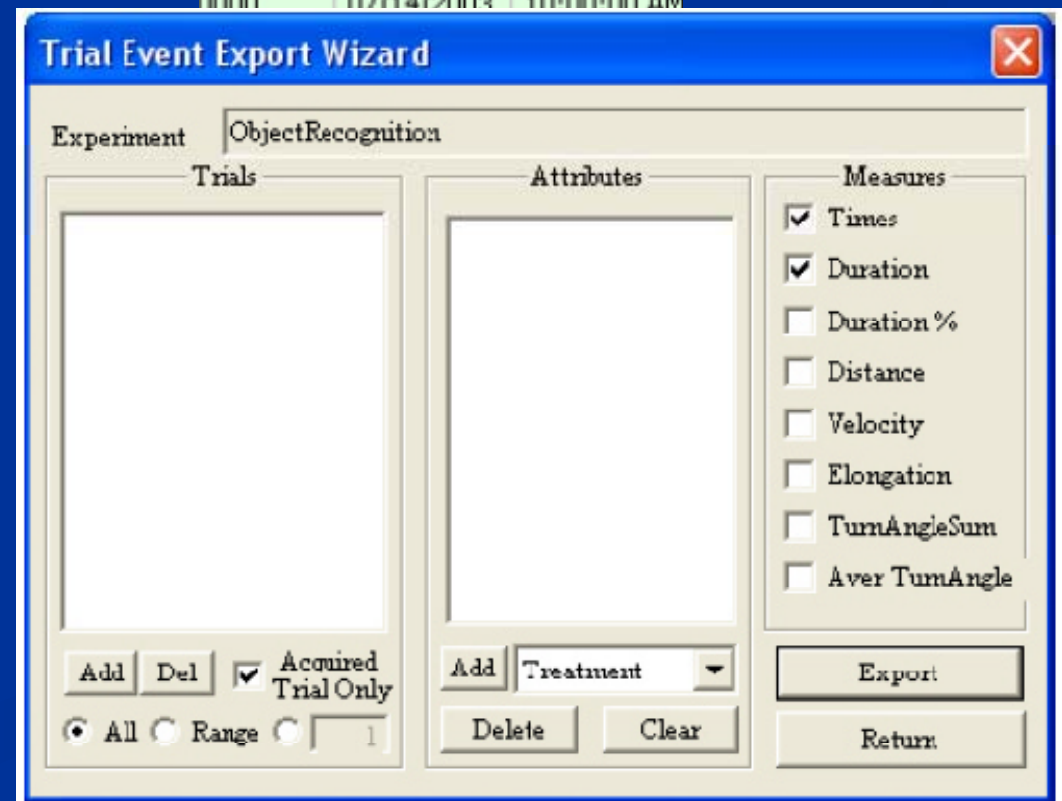
整組事件輸出(Group Event Export)

- 輸出之Excel檔

多組連續分析(Multi-task analyzing)

- 將影片檔、實驗區設定、事件偵測設定等加入，可連續分析多筆影片並自動載入結果。

Thank You