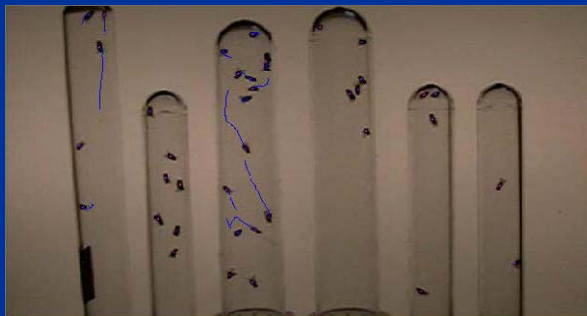
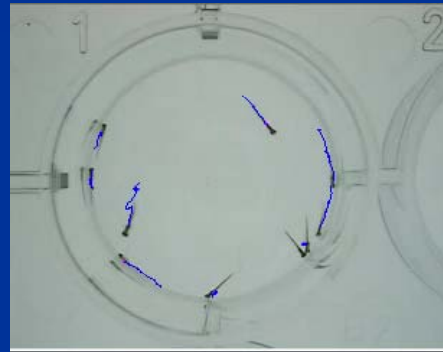
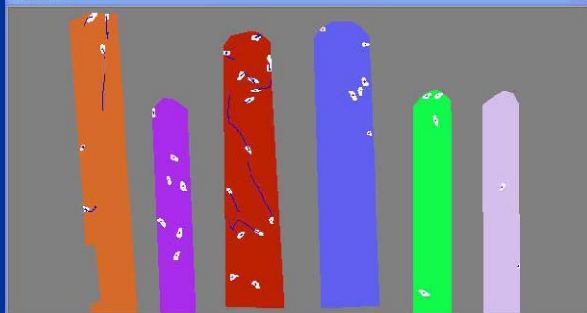


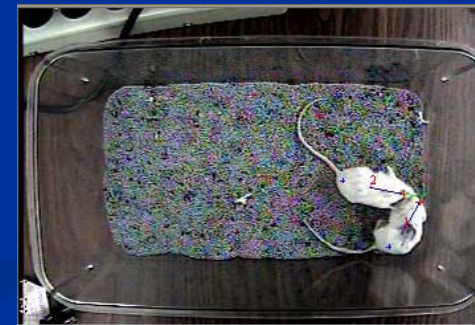
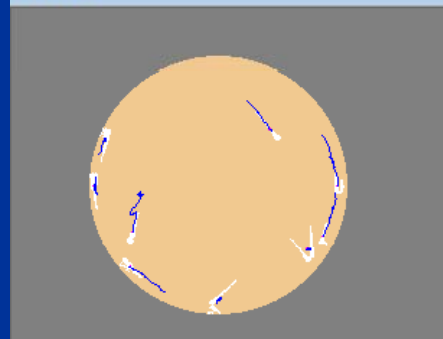
動物影像擷取分析系統 Clever System GroupScan & SocialScan



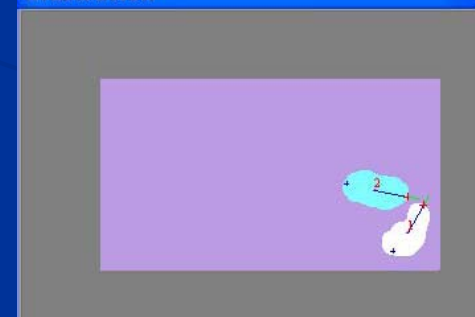
Illustration



Illustration



Illustration



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

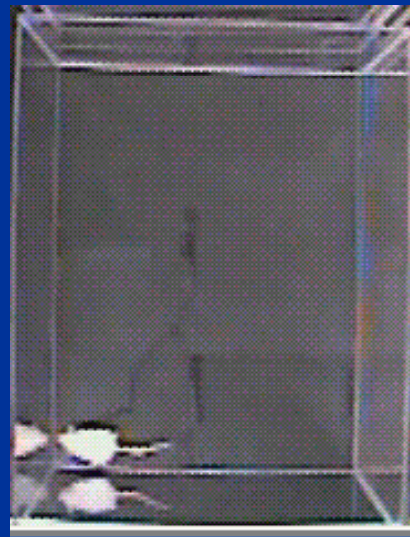
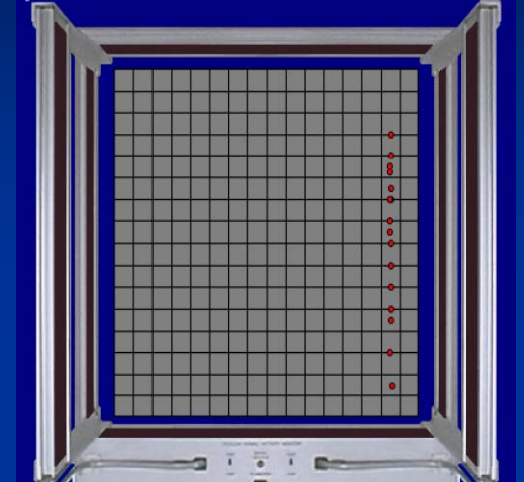
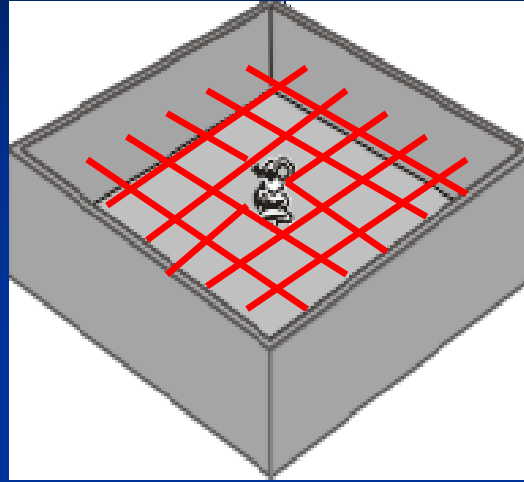
- 影像擷取: DV or CCD camera
- 影片格式: MPEG file
- 解析度: 352*240 or 640*480
- 攝像率: 30 frames/sec NTSC

■ 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

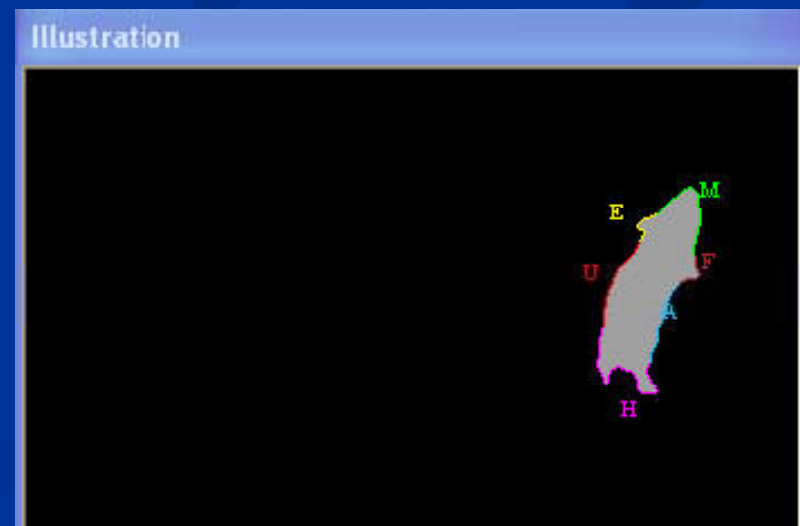
Photo-beams
↓
Video tracking
↓
Behavior recognition



Clever: Video tracking + Behavior recognition

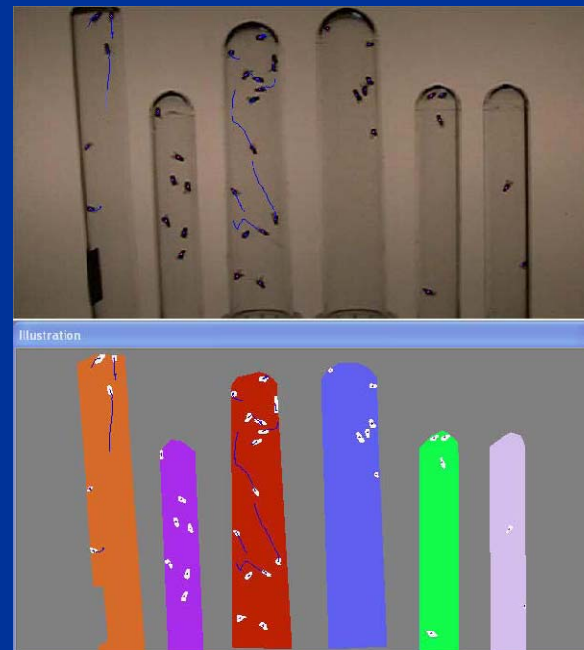
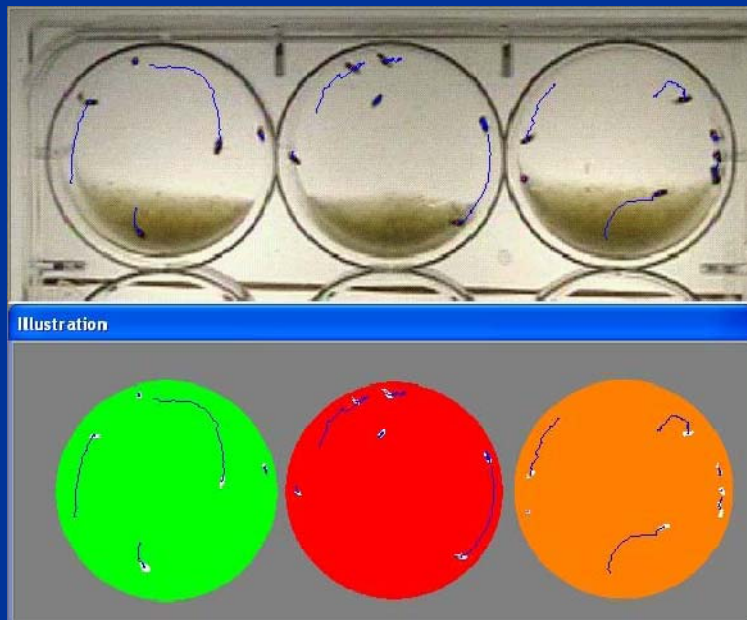
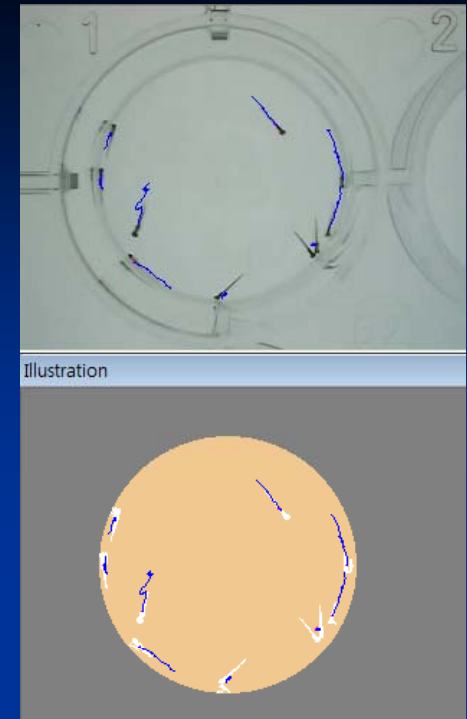
Clever system

- 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： <ul style="list-style-type: none">• 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

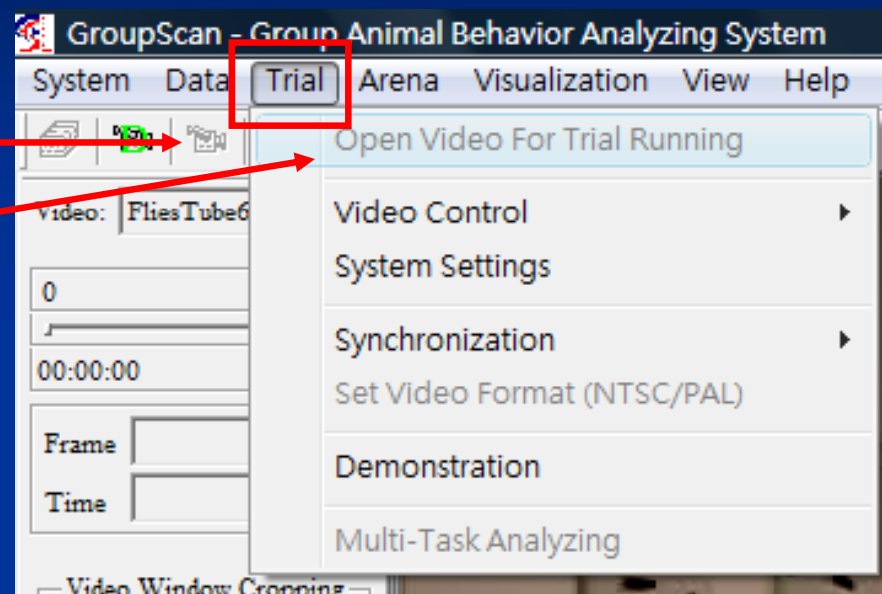
1. 選擇要分析的影像檔案
↓
2. 設定實驗區(Arena)數目
↓
3. 設定實驗區(Arena)範圍、區塊(Zone)範圍、面積區域(Area)命名、及距離校正
↓
4. 設定事件(Event)準則及偵測分析準則
↓
5. 開始影像分析
↓
6. 結果儲存&輸出
↓
7. 結果視算

1. 選擇要分析的影像

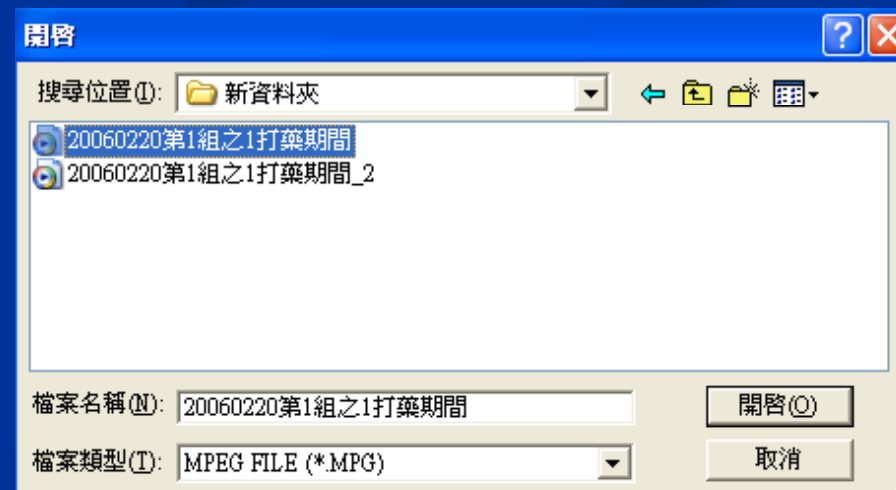
- 兩種方式將影片開啟:



2. "Open Video For Trial Running"

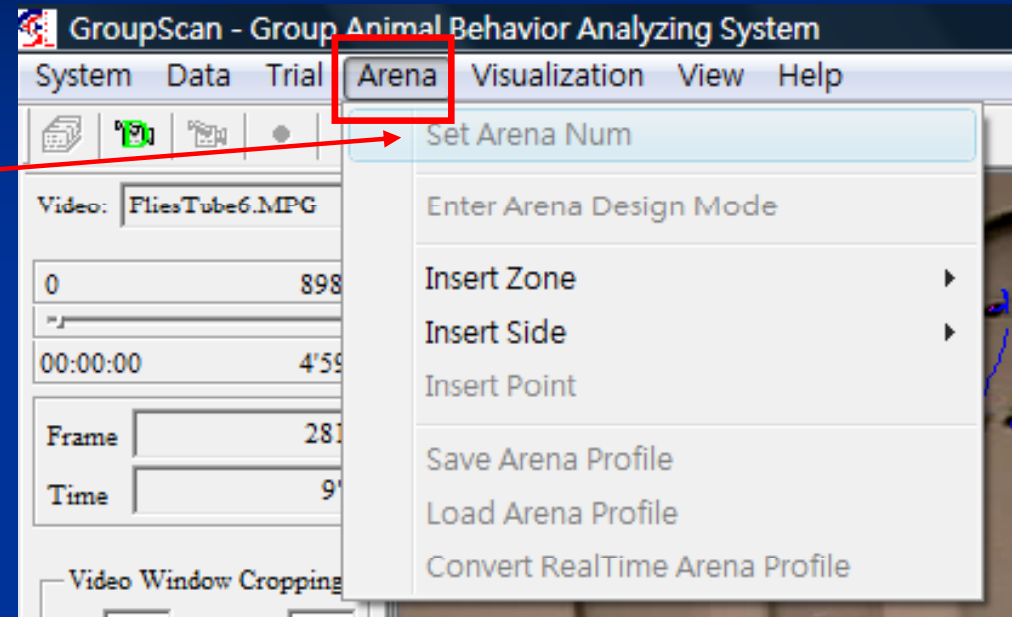


- 選擇要分析的影片檔並開啟



2. 設定實驗區(Arena)數目

- “Set Arena Num”

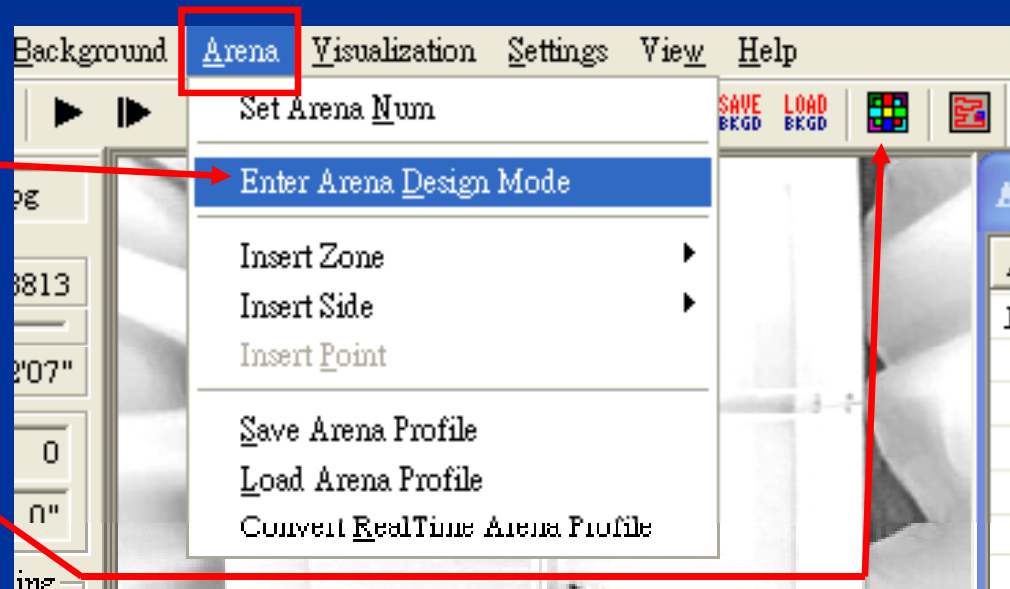


- 輸入實驗區數目



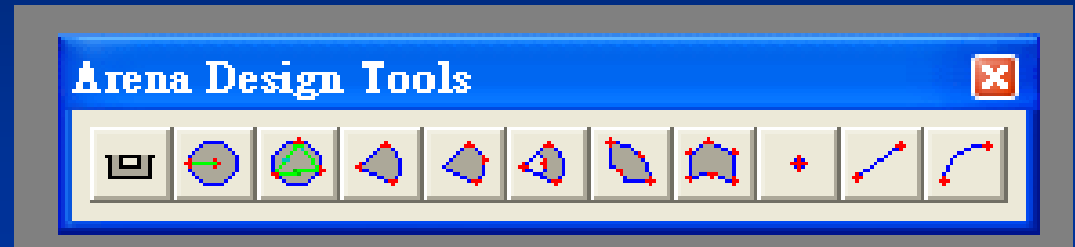
3-1. 設定實驗區(Arena)及區塊(Zone)範圍

- "Enter Arena Design Mode" 或 

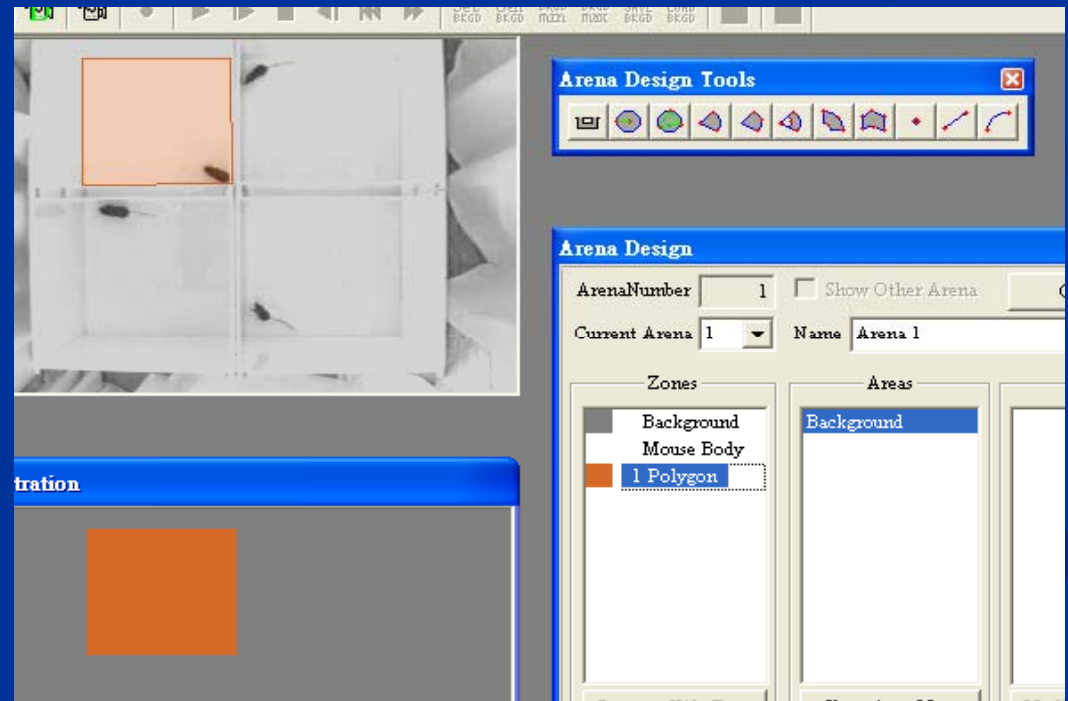


3-1. 設定實驗區(Arena)及區塊(Zone)範圍

- 依實驗區形狀選擇工具

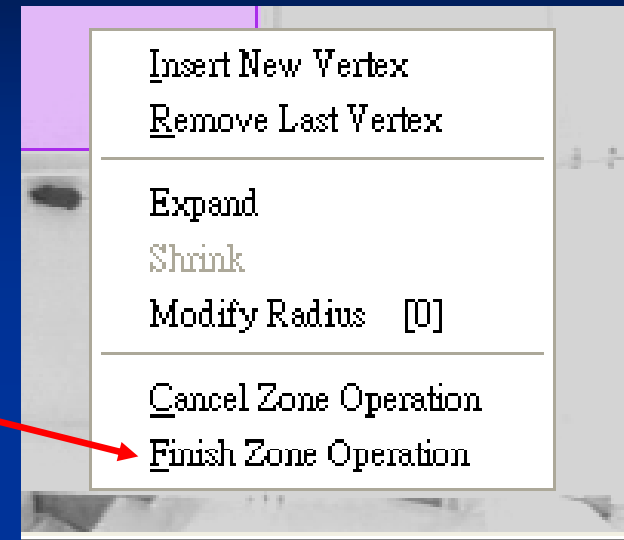


- Ex. 選擇Polygon()鍵來點選實驗區的範圍

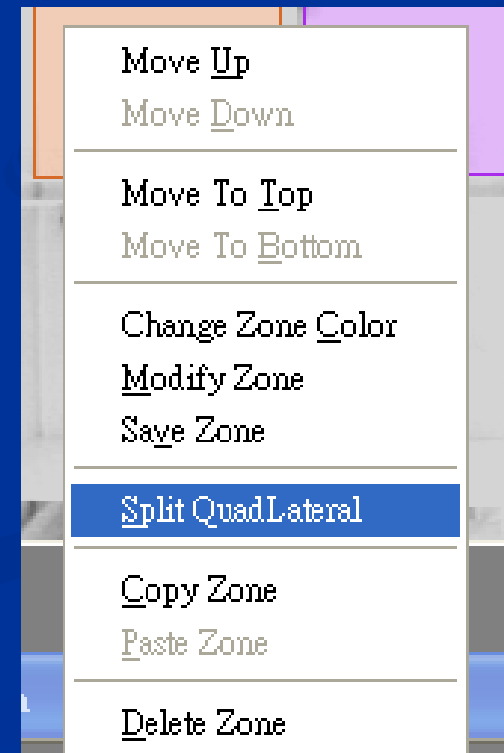


3-1. 設定實驗區(Arena)及區塊(Zone)範圍

- 按滑鼠右鍵，點選“Finish Zone Operation”

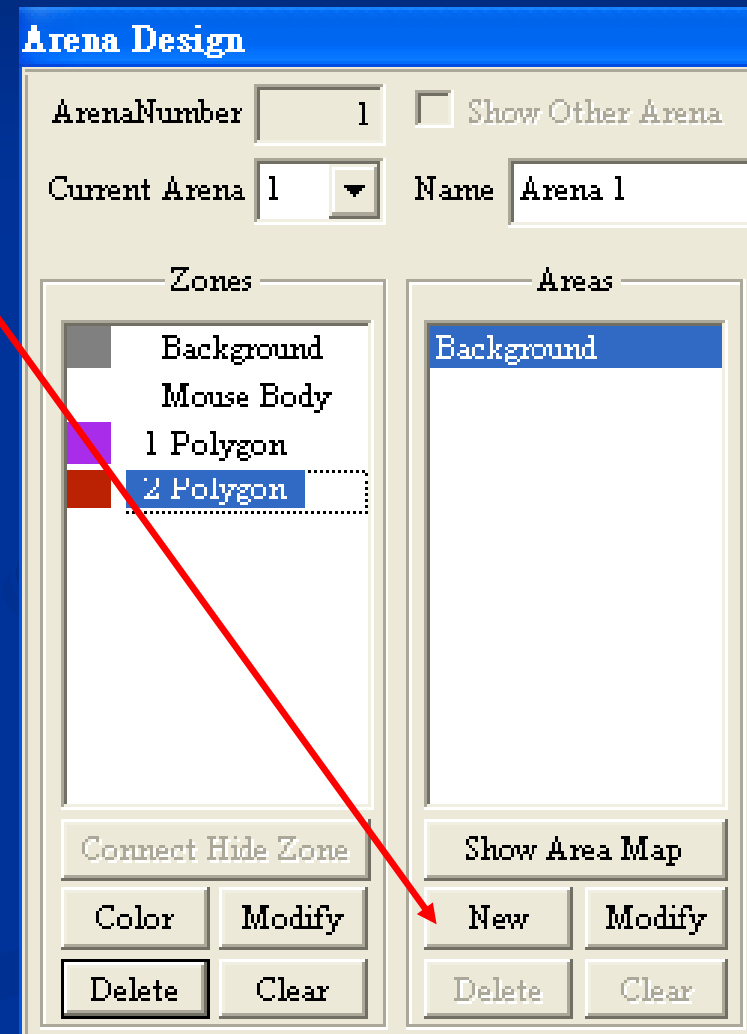
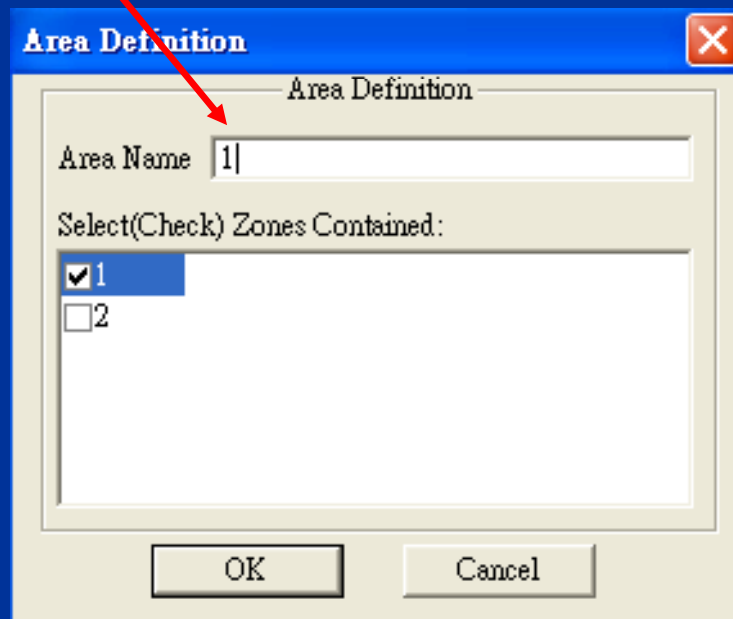


- 再按一次右鍵出現之選項



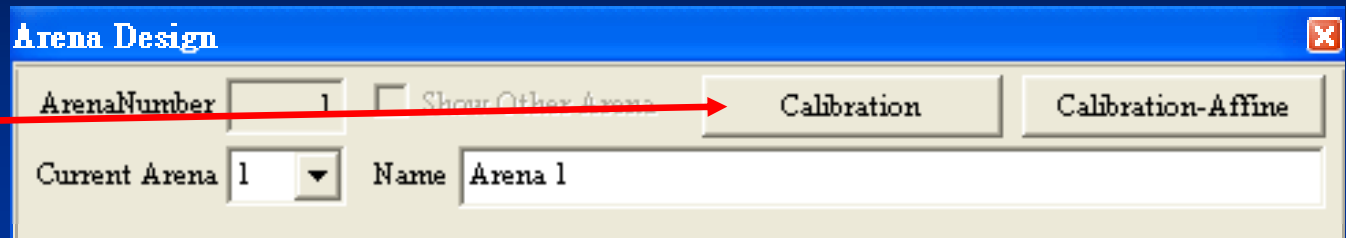
3-2. 面積區域(Area)命名

- 點選Areas欄位的”New”，勾選要命名的區塊號碼，並輸入名稱

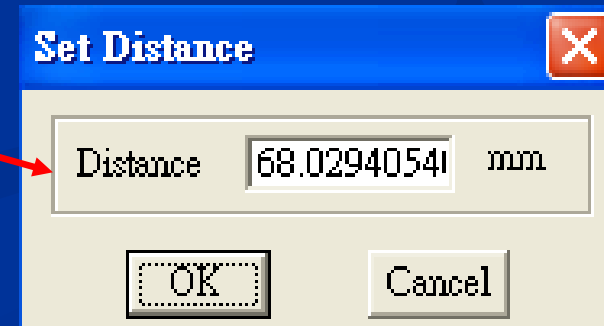
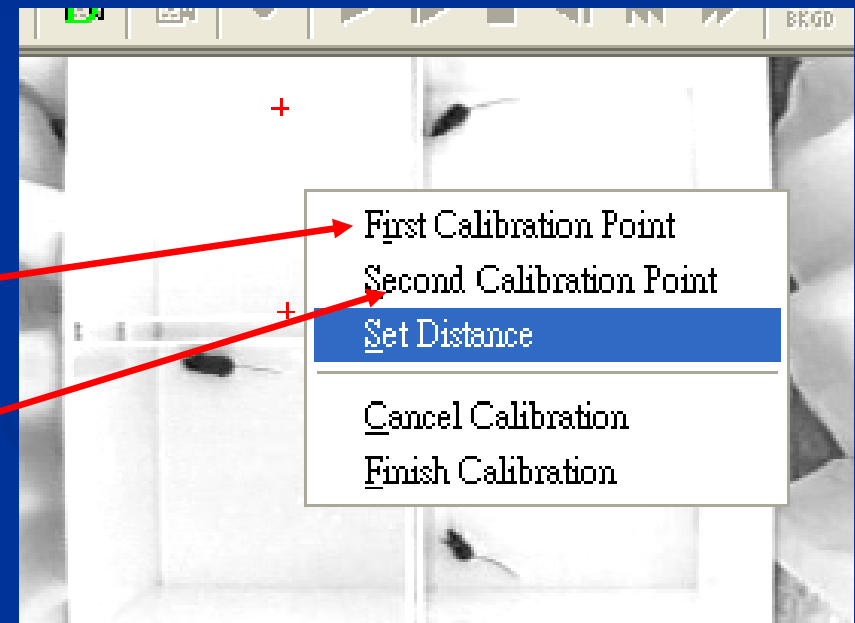


3-3. 距離校正(Calibration)

- “Calibration”

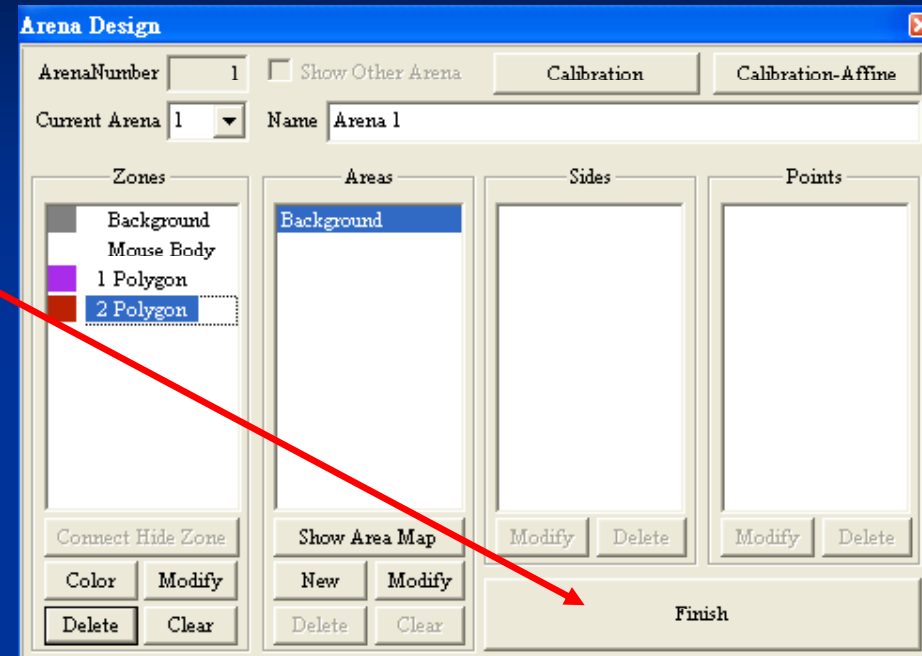


- 起始點按右鍵，點 “First Calibration Point”
- 終點按右鍵，點 “Second Calibration Point”
- 再按右鍵，點 “Set Distance”，輸入兩點實際的距離

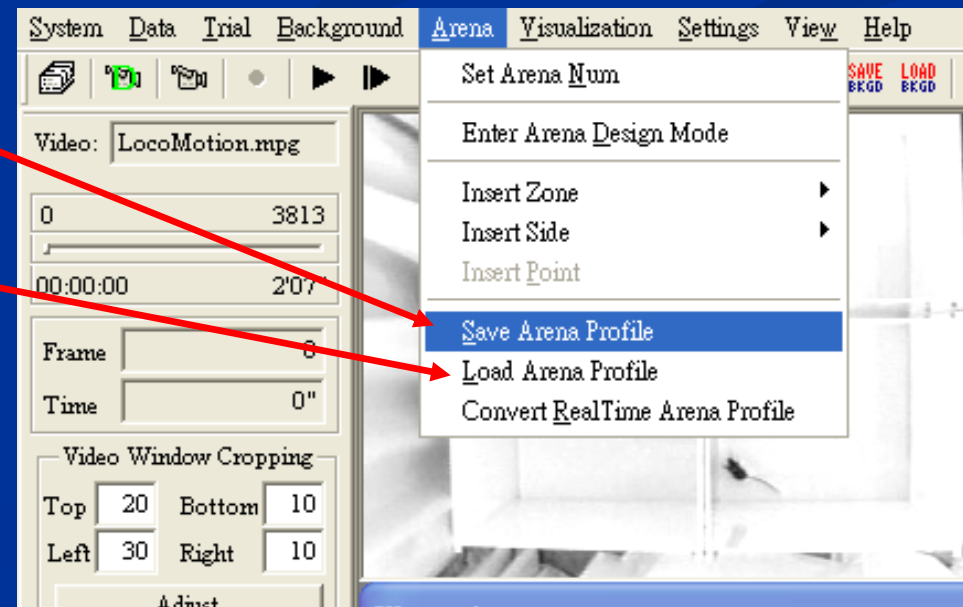


3-4. 實驗區設定完成&儲存

- 設定完成，點”Finish”

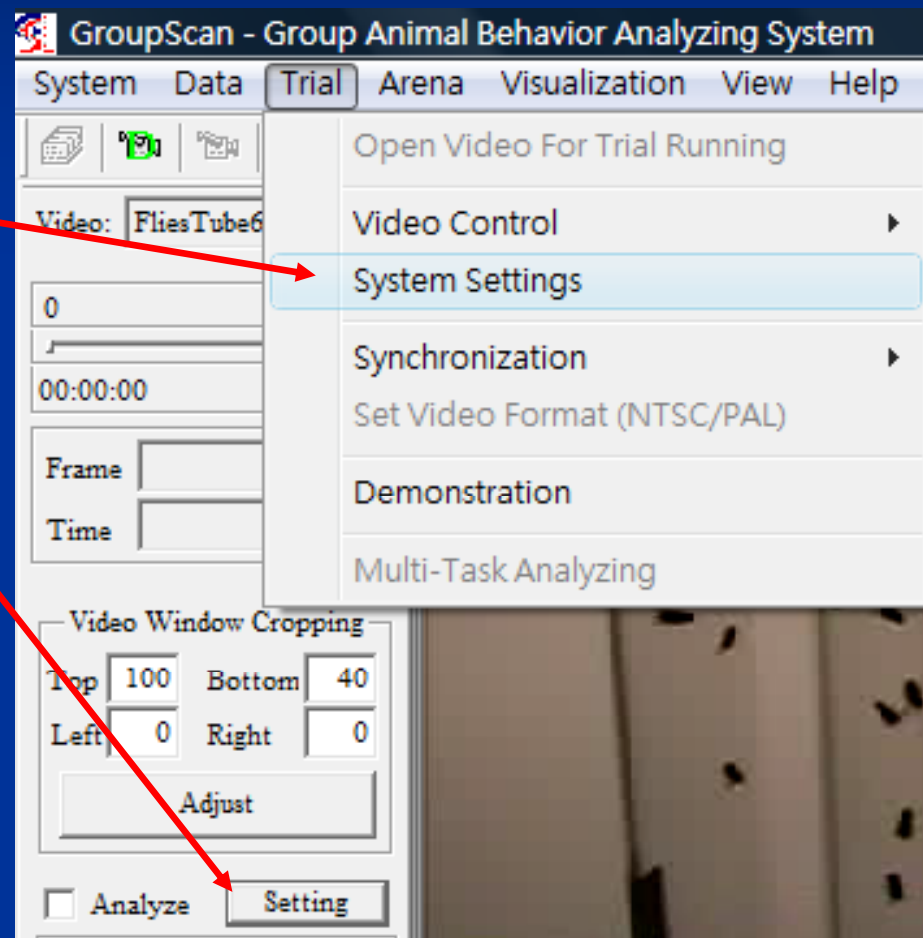


- ”Save Arena Profile”: 實驗區設定存成.GCG檔案
- ”Load Arena Profile”: 檔案輸入



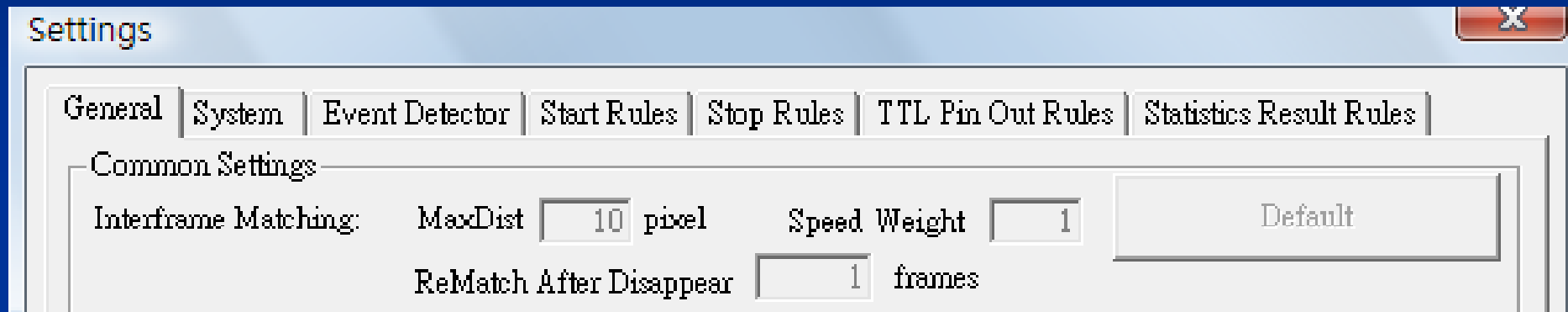
4. 設定事件(Event)準則及偵測分析準則

- "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	<input type="text" value="30"/>	Frame Motion >	<input type="text" value="4"/>	mm	Seperate Threshold (pix):	<input type="text" value="4"/>
Speed Calculation:	Frame Disp:	<input type="text" value="30"/>				
Estimation	<input type="radio"/> Dead Zone	<input checked="" type="radio"/> Same	<input type="radio"/> Ratio	<input type="text" value="0"/>		
Live	Active Value >	<input type="text" value="1"/>	Active Value Decrease	<input type="text" value="0.005"/>	every frame	

2. Active Motion:

- 30 Frames Motion > 4mm:
- Separate Threshold:

3. Speed Calculation:

4-1. System Settings-Common Settings

Active Motion	<input type="text" value="30"/>	Frame Motion >	<input type="text" value="4"/>	mm	Seperate Threshold (pix):	<input type="text" value="4"/>
Speed Calculation:	Frame Disp:	<input type="text" value="30"/>				
Estimation	<input type="radio"/> Dead Zone	<input checked="" type="radio"/> Same	<input type="radio"/> Ratio	<input type="text" value="0"/>		
Live	Active Value >	<input type="text" value="1"/>	Active Value Decrease	<input type="text" value="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

Arena Specific Settings

Current: 1 [Set To Default Setting] [Apply To All Arenas]

Object Color: Darker Than Background Lighter Than Background

Object Size: Minimum: 10 (Pixels) Maximum: 2000 (Pixels)

Grey Level Threshold: Automatic Static: 40 Dynamic: 60

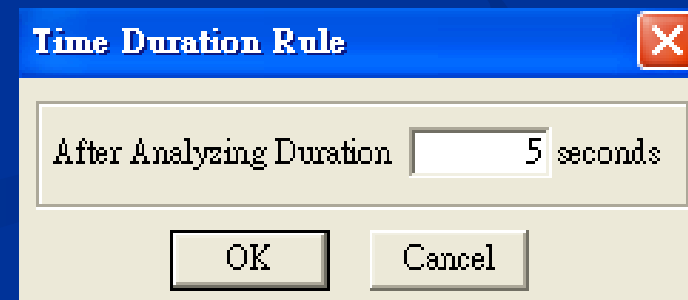
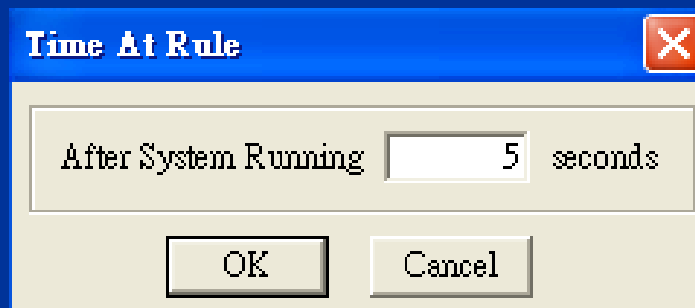
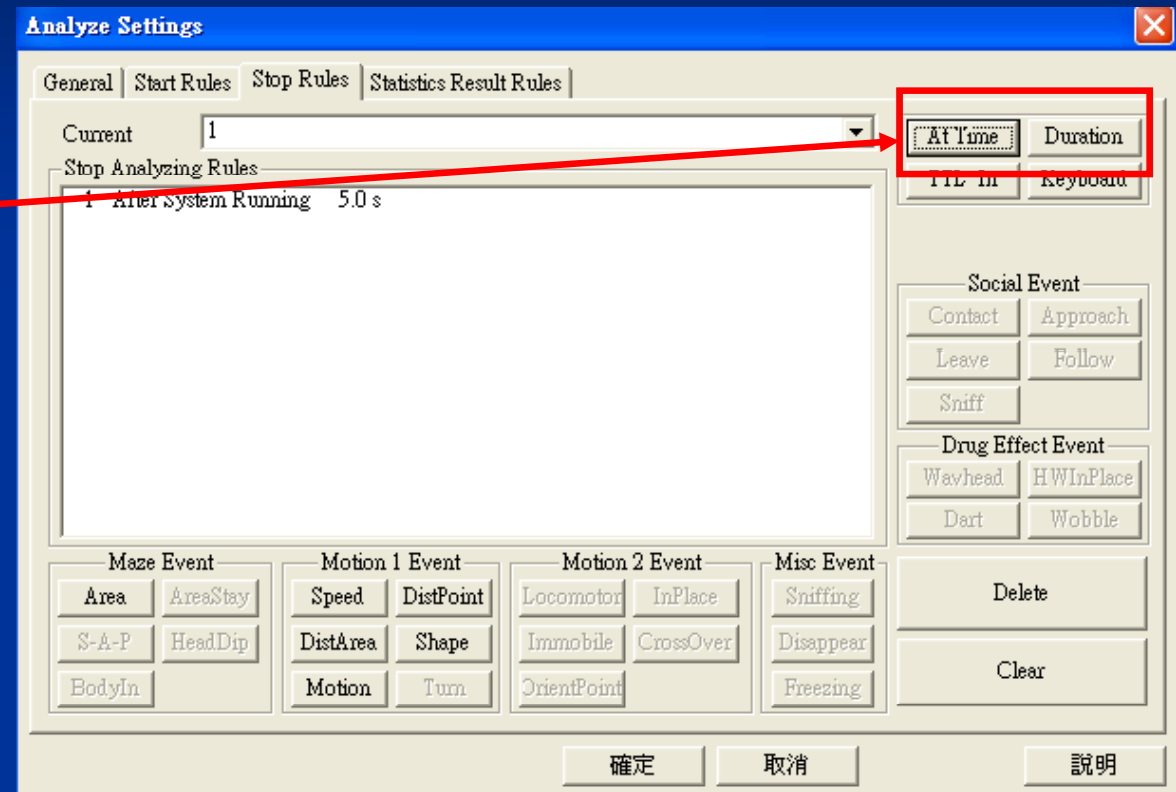
Set Animal Number: 20

6. Gray Level Threshold:

7. Set Animal Number: 設定每一區域的動物數目。

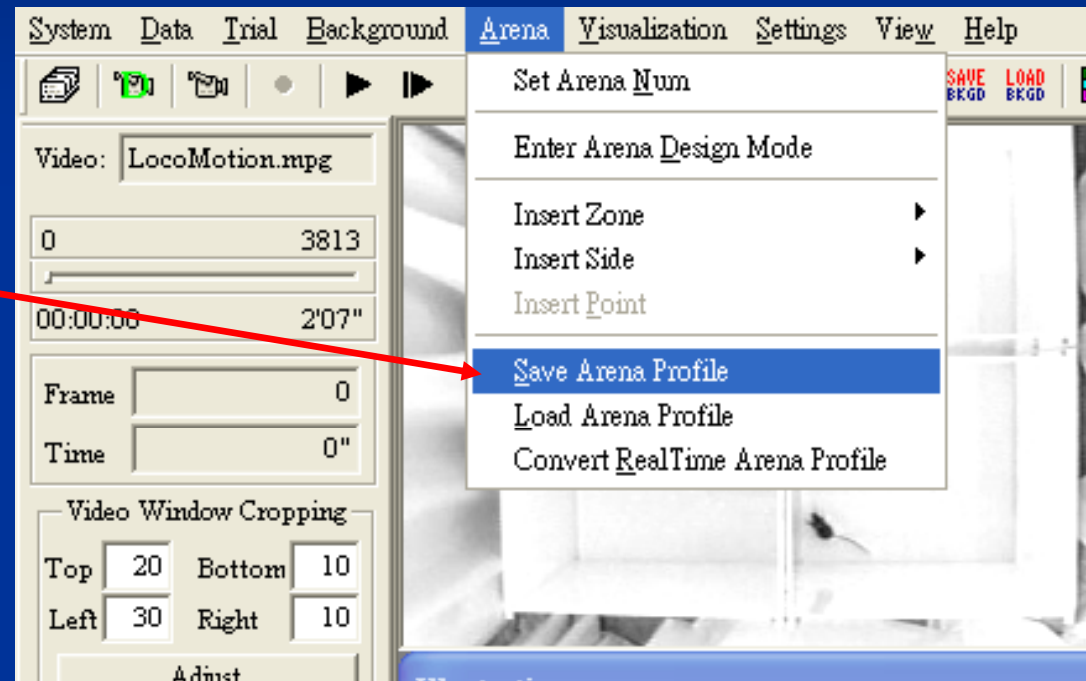
4-2. Start Rules & Stop Rules

- Start Rules: At Time
- Stop Rules: At Time or Duration

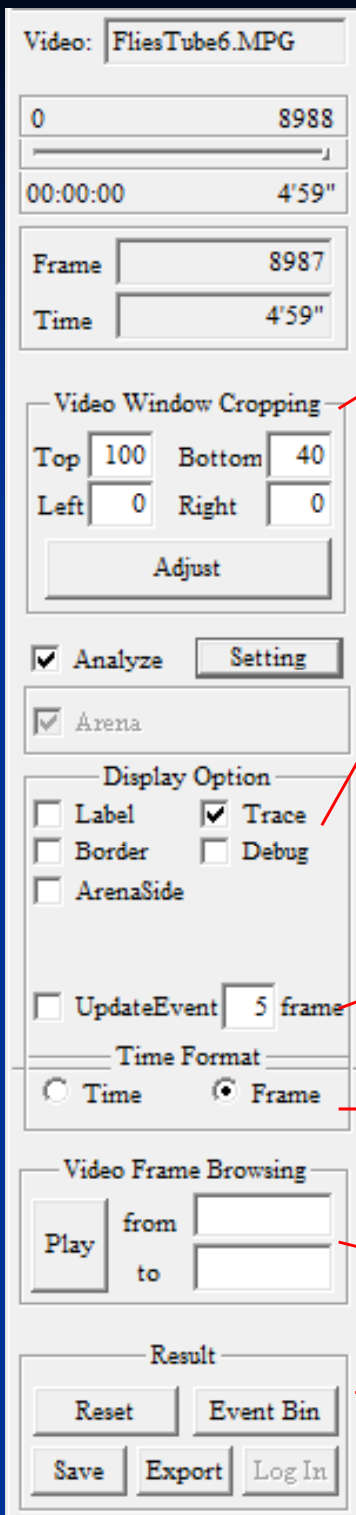


4-3. 儲存事件統計準則設定

- "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



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

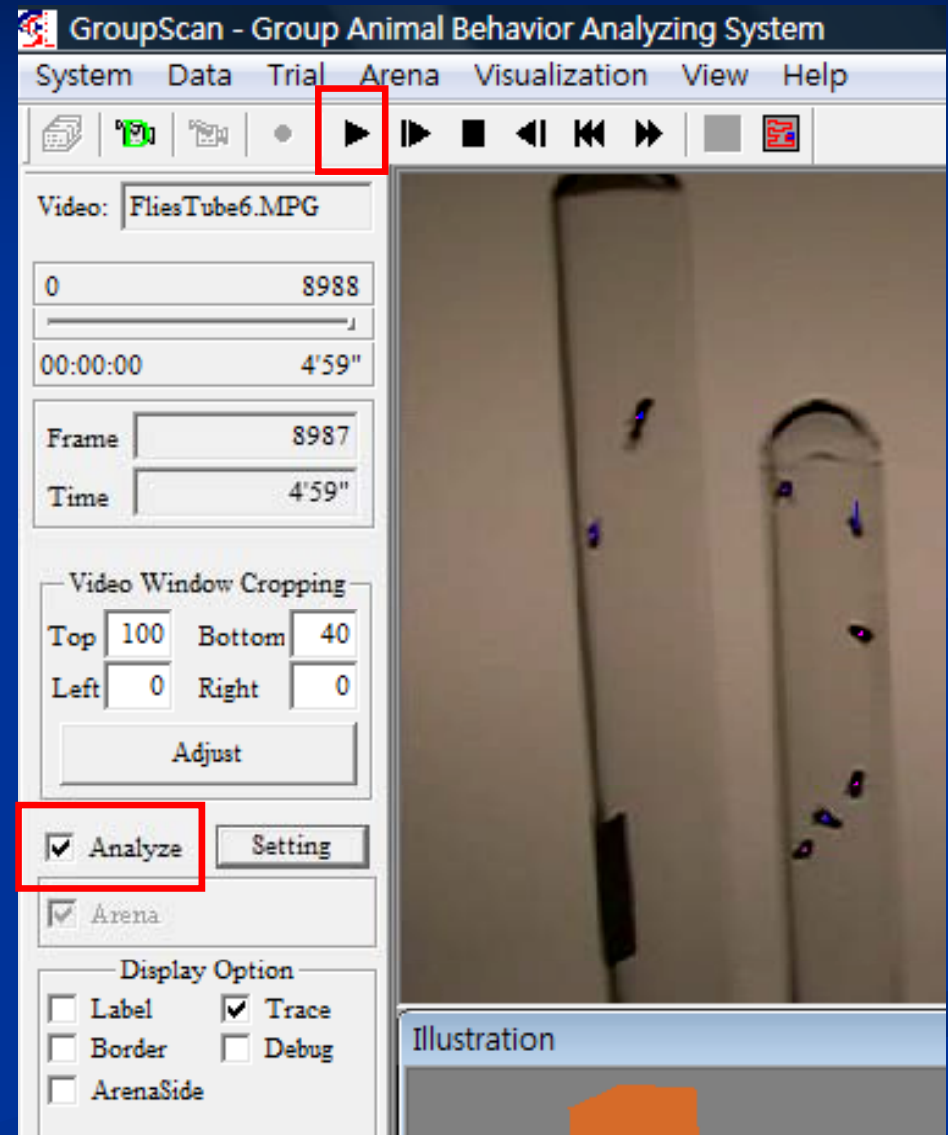
時間形式

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

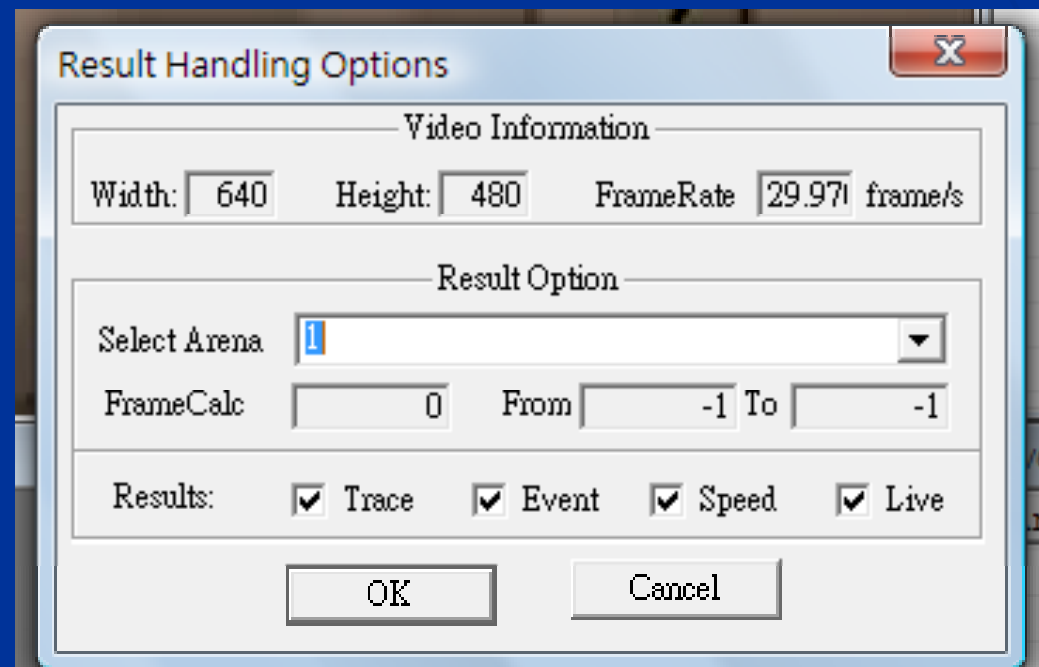
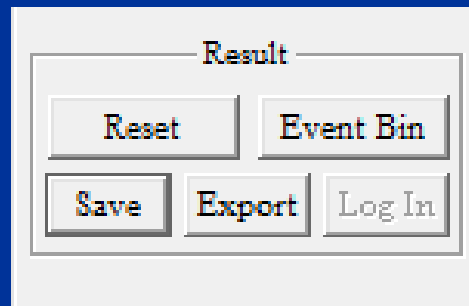
開始分析

- 勾選“Analyze”，按下Play (▶) 鍵開始分析



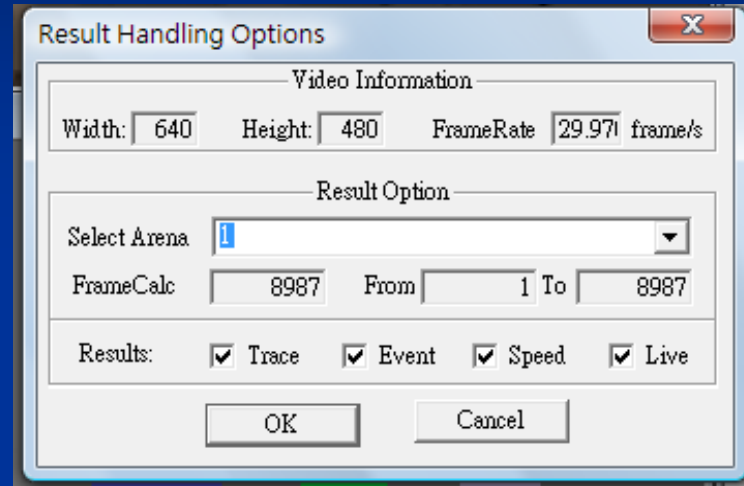
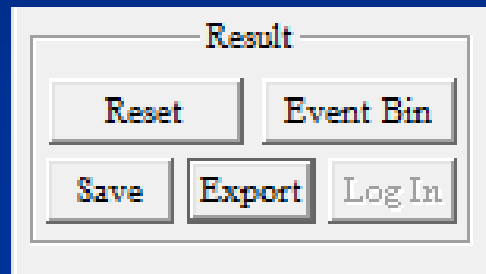
6-1. 結果儲存 (Result Save)

- "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

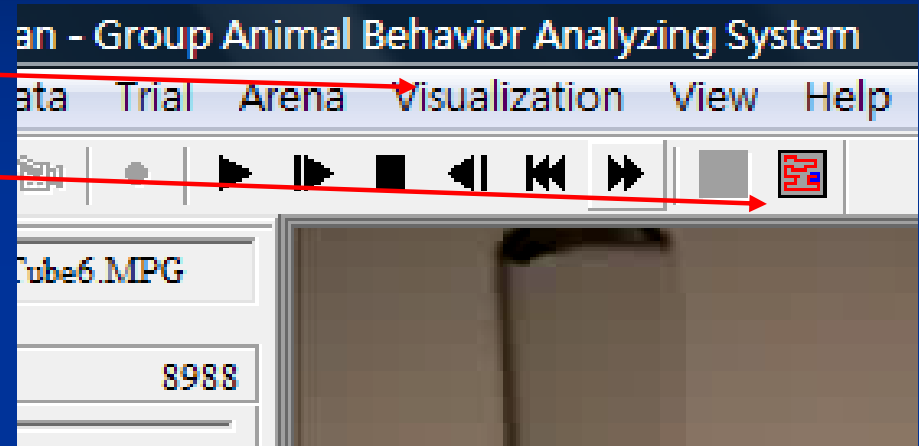
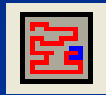


	A	B	C	D	E	F	G	H	I	J	K
1	Statistics Result of Arena 1										
2	ID	From(Frame)	To(Frame)	Duration(Frame)	Max VisibleCount	Cur VisibleCount	Max LiveCour	Cur LiveCoun	Cur StaticCount	Total AvgSpeed	Active AvgSpeed
3	1	1	8987	8986	5	2	5	2	0	0.37	4.12
4											

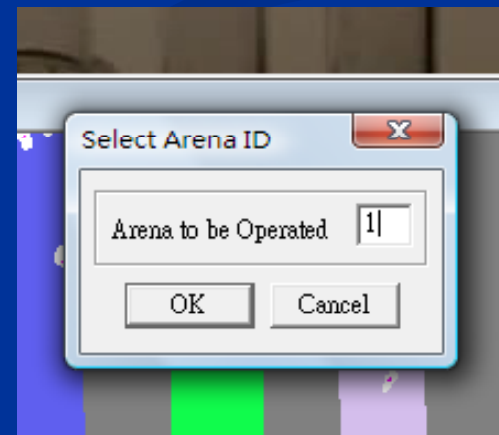
	Export of Live Event									
	Arena	From(Frame)	To(Frame)	Duration(Frame)	Live Count	Total Avg. Speed	Active Avg. Speed	Travel Dist.		
5	1	2	4159	4157	5	3.79	12.22	525.75		
6	1	4159	8791	4632	4	1.2	10.35	184.97		
7	1	8791	8814	23	3	0.65	5.6	0.5		
8	1	8814	8987	173	2	0.52	4.73	2.97		

7. 結果視算(Result Visualization)

- Visualization的 “Result Visualization”，或



- 選擇欲分析之區域



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

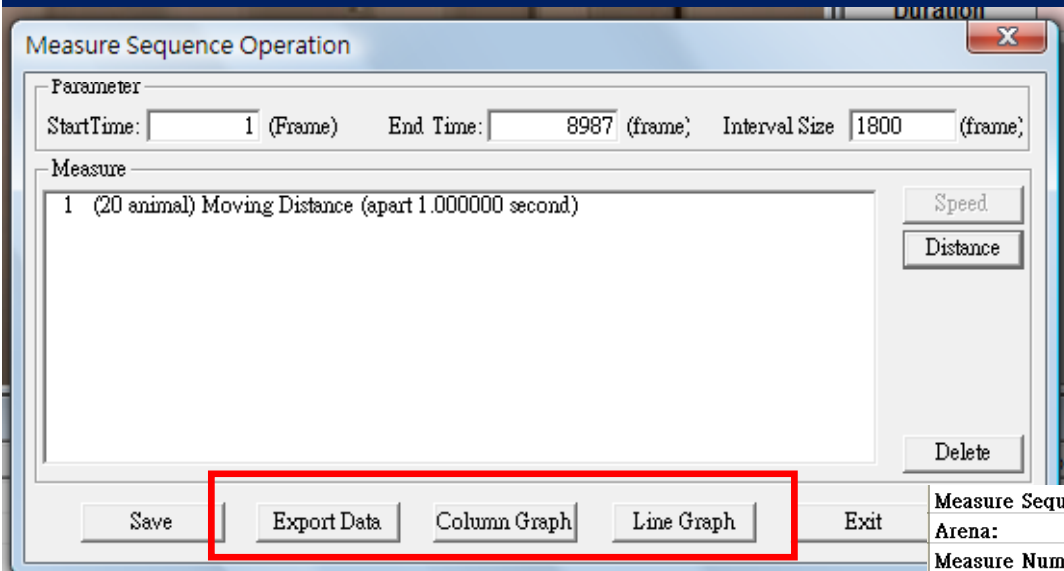
The screenshot displays a software interface with three main sections: Measure, Browsing Control, and Result. The Measure section at the top contains three buttons: Seq, Value, and Hist, which are highlighted with a red border. The Browsing Control section below it includes a GoTo button next to a text input field containing the number 1, and a PlayTo button next to a text input field containing the number 8987. The Result section at the bottom contains four buttons: Save, Export, Attr Log In, and Bin Log In.

Measure	
Seq	Value
	Hist

Browsing Control	
GoTo	1
PlayTo	8987

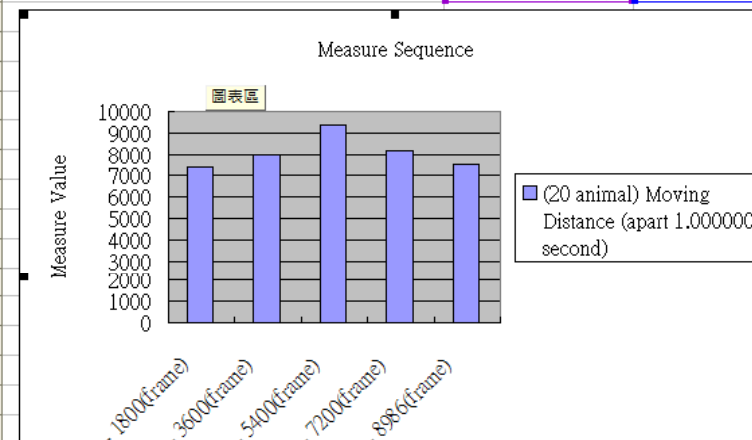
Result	
Save	Export
Attr Log In	Bin Log In

Seq: 輸入間隔時間及項目



Measure Sequence Output of GroupScan

Arena:	3	
Measure Number:	1	
Start Time (frame):	1	
Stop Time (frame):	8987	
Bin Size (frame):	1800	
Bin	Duration(Frame)	(20 animal) Moving Distance (apart 1.000000 second)
1	1 - 1800(frame)	7397.224726
2	1801 - 3600(frame)	7983.059827
3	3601 - 5400(frame)	9357.307045
4	5401 - 7200(frame)	8167.11642
5	7201 - 8986(frame)	7511.481296



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

Measure Calculation

Measure (20 animal) Moving Distance (apart 1.000000 second)

Avg. Speed Distance

Temporal Parameter

Interval StartTime: 1 (frame) End Time: 8987 (frame)

Event Detected

Operation

Calculate 40416.189314 Log Into Exit

Measure Histogram

Measure

Avg. Speed

Temporal Parameter

Interval StartTime: 1 (frame) End Time: 8987 (frame)

Event Detected

Histogram Parameter

Estimate MinValue 0 MaxValue 100 BinSize 1

Histogram Export Histogram Graph Exit

SocialScan

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



	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列參數： ●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



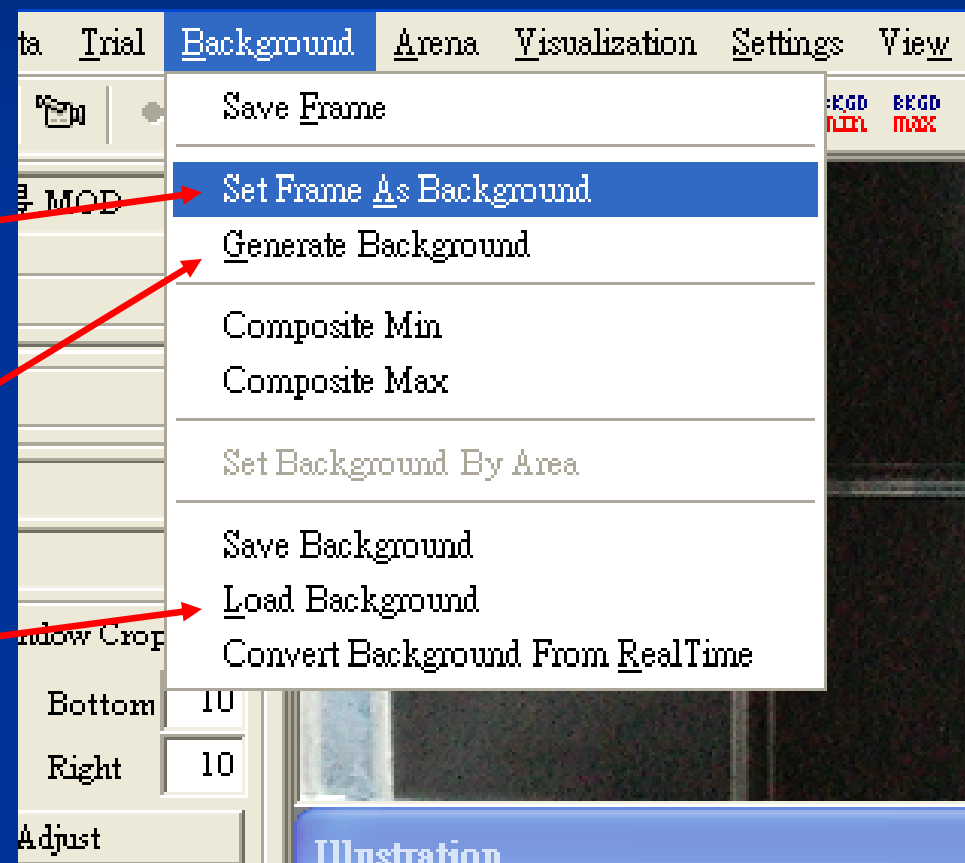
7. 結果儲存&輸出



8. 結果儲存&輸出

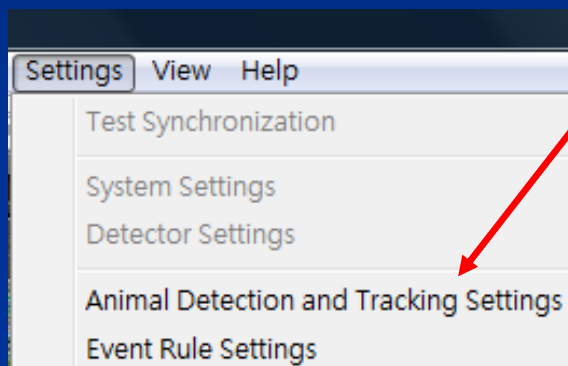
2. 設定背景、產生背景、合成背景及輸入背景

- 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



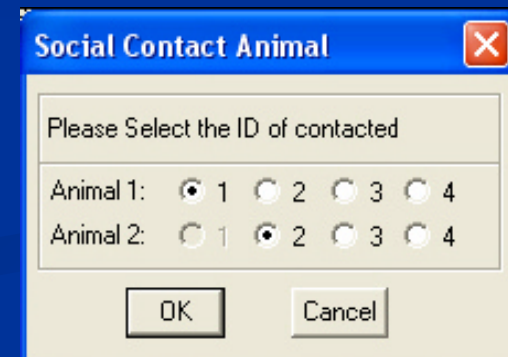
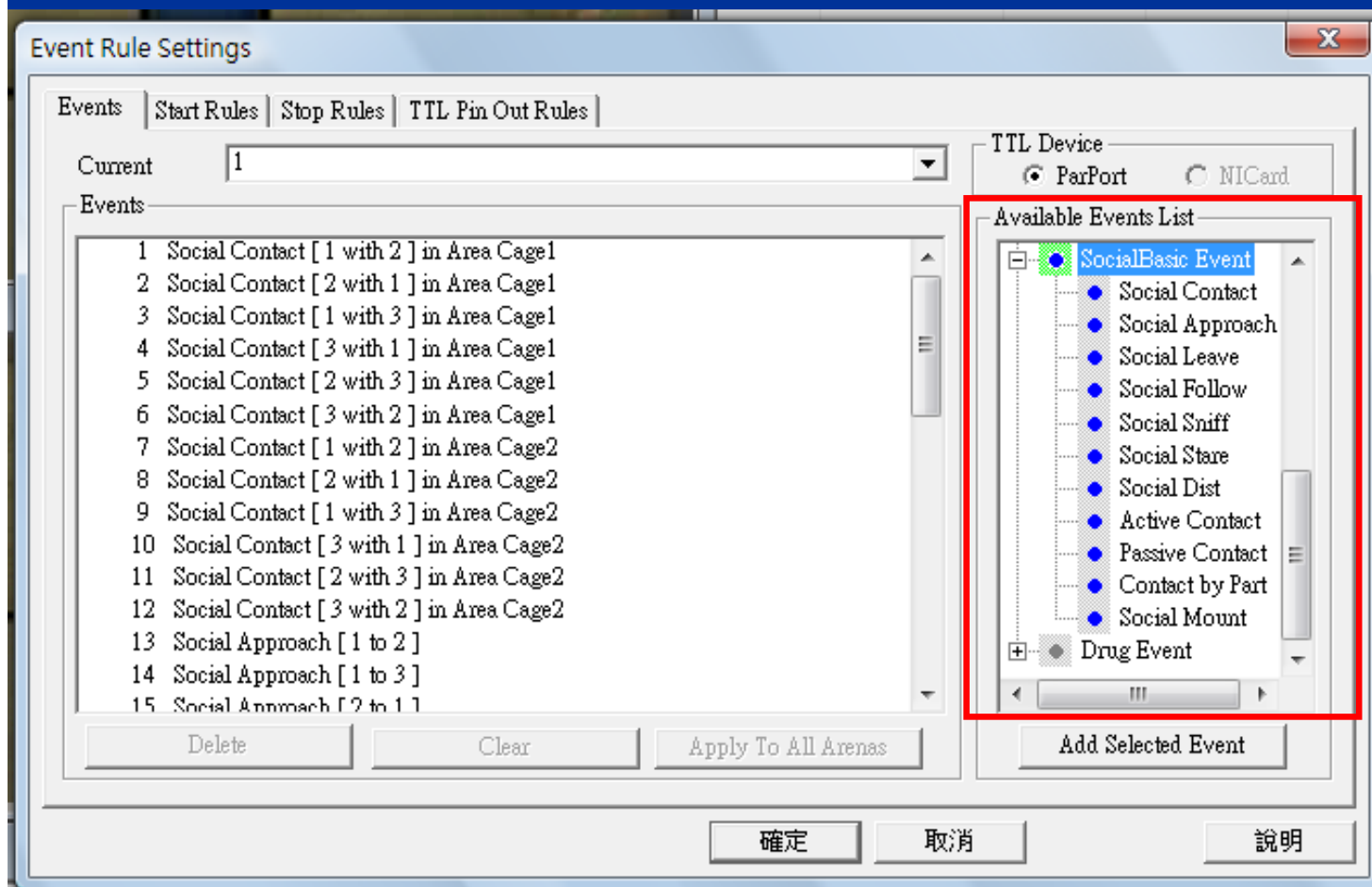
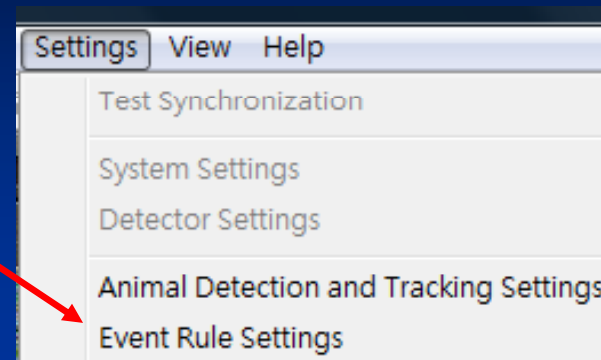
5-1. 設定事件(Event)準則及偵測分析準則

■ “Animal Detection and Tracking Settings”

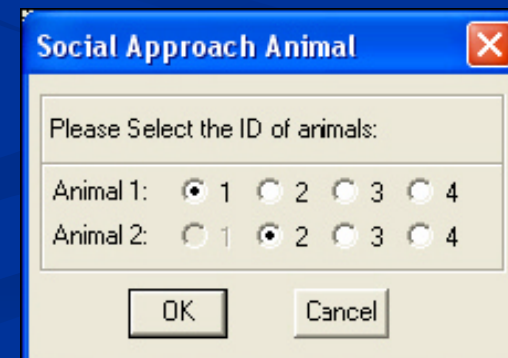


5-2. 設定事件(Event)準則及偵測分析準則

■ “Event Rule Settings”



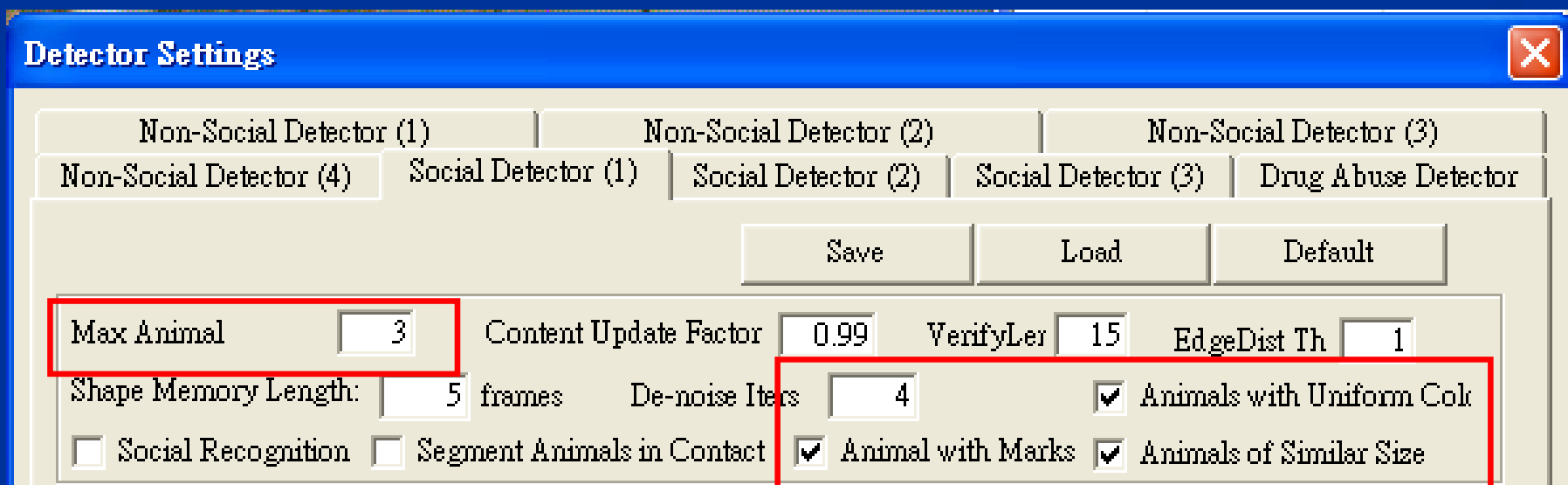
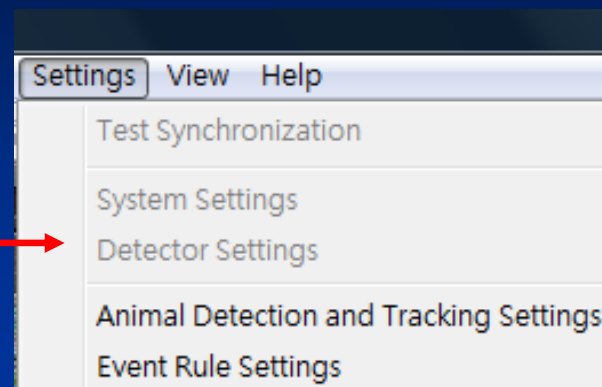
[1,2]=[2,1]



[1,2] ≠ [2,1]

5-3. 設定事件(Event)準則及偵測分析準則

- “Detector Settings”



Ex. Approach Detection

- Dist:
- Angle:
- Move:
- Sequence:

Approach Detection

Action dist < mm Angle < °

Frame Move 1 > 2 < mm

Condition: At the end InterDist < mm

Travel Dist of Animal 1 mm

Heading Direction: Nose Movement

Sequence: Approach: N M

Normal: N M

分析結果

TopScan - TopView Behavior Analyzing System

File Data Trial Background Arena Visualization Settings View Help

Signal: SocialContact.MPG

0 6030

00:00:00 3'21"

Frame 4483

Time 2'29"

Analyze

Arena

Design Tracking Event

Display Option

Sniff/Nose Trace

Orient Waist

Label Debug

ArenaSide Border

OverLay OnArena

Time Format

Time Frame

Update View

Event 5 frames

Others 5 frames

Result

Reset Save Export

Log In Proc TrcImg

Video Window Cropping

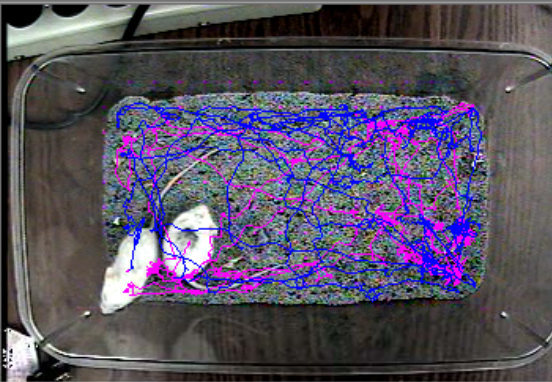
Top 0 Bottom 0

Left 0 Right 0

Adjust

Video Frame Browsing

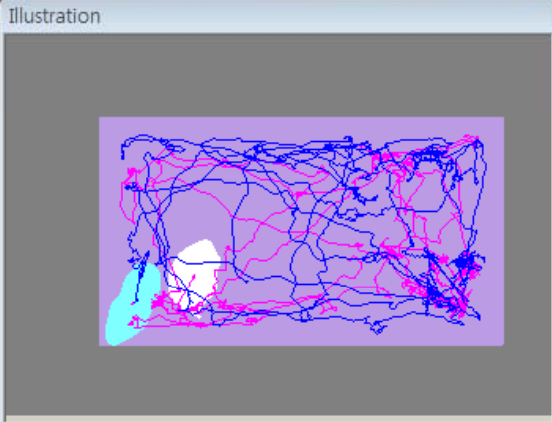
Play from to



Arena Status

Arena	State	Start	Stop	Duration	Comment
1	Stop	1	4483	4483	Analyze Stopped

Illustration



Event

ID	From	To	Length	Event
57	3956	3977	21	Distance between [1 and 2] Less Than...
58	3956	3977	21	Distance between [2 and 1] Less Than...
59	3976	4134	158	Social Leave [2 from 1]
60	4072	4210	138	Social Leave [2 from 1]
61	4093	4210	117	Social Leave [1 from 2]
62	4149	4216	67	Social Leave [1 from 2]
63	4212	4320	108	Social Leave [2 from 1]
64	4372	4484	112	Distance between [1 and 2] Less Than...
65	4372	4484	112	Distance between [2 and 1] Less Than...
66	4386	4484	98	Social Contact [1 with 2]
67	4406	4411	5	Social Sniff [1 sniff 2 Body]

Result

Event Statistics Social Distance Statistics Signal Debug Information

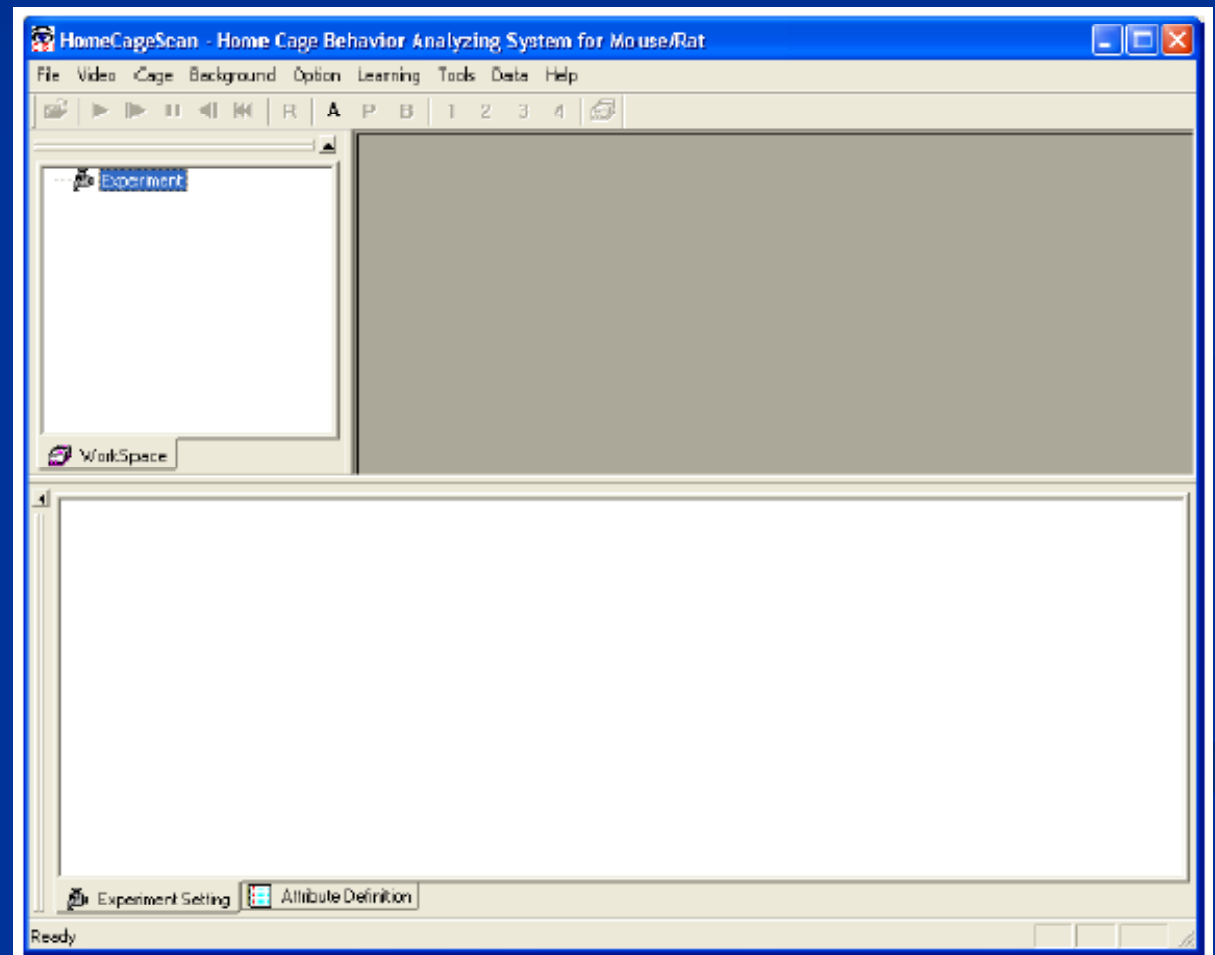
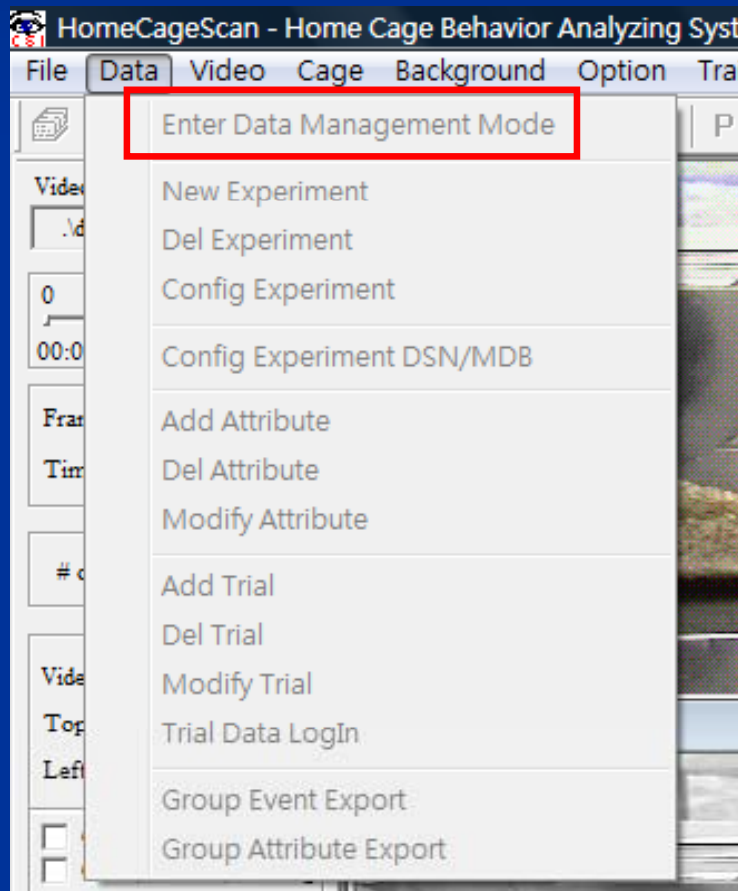
Arena	Criteria	Times	Duration	%	Latency	Dist (mm)	V (mm/s)	Elong	TAngleSum	AverAngle
1	Social Contact [1 with...	9	1513	33.8	45	686.16	13.59	1.62	-224.98	-4.46
1	Social Approach [1 to 2]	0	0	0.0						
1	Social Approach [2 to 1]	0	0	0.0						
1	Social Leave [1 from 2]	7	593	13.2	1817	650.23	32.86	1.77	-111.20	-5.62

Ready

GroupScan... social scan Microsoft W... TopScan - T... clever works... SocialScan... demo CH ? < > 下午 02:09

資料管理模式 (Data management mode)

- 點選  或由 Data → Enter Data Management Mode

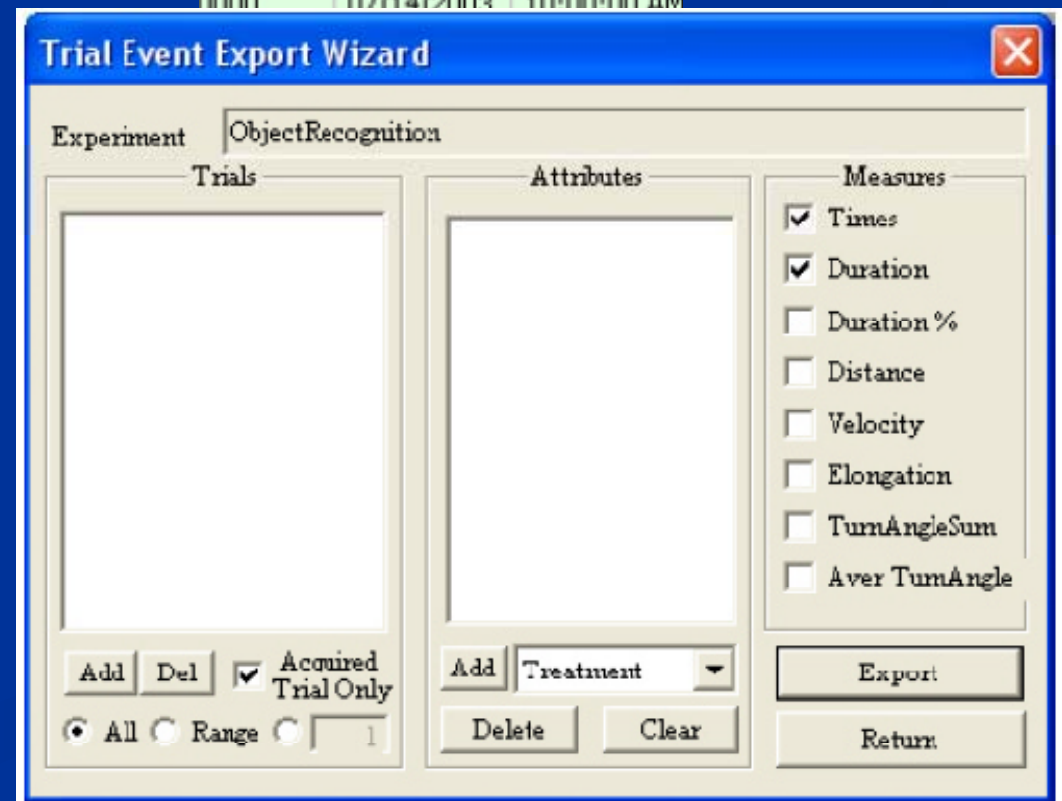


整組事件輸出(Group Event Export)

- 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。



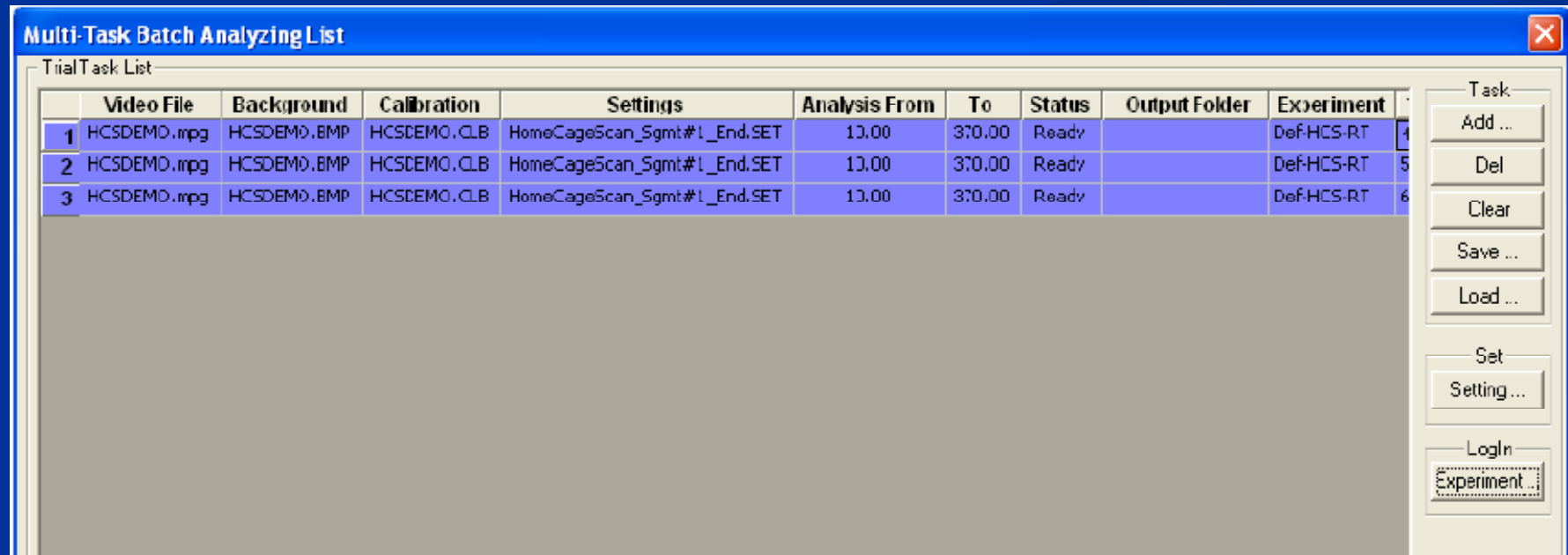
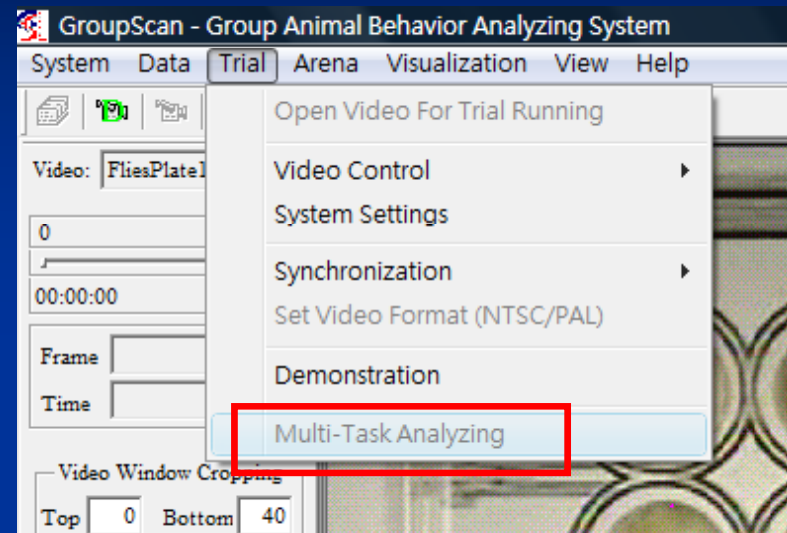
整組事件輸出(Group Event Export)

- 輸出之Excel檔

A	B	C	D	E	F	G	H	I
Trial Num	16							
Trial ID	Arena	Treatment	Dosage (ug/r	Date	Time	Events	Times	Duration(Frame)
1	1	Vehicle		7/14/2008	9:00:00 AM	Mouse 1 sniffing On Object 1	2	34
1	1	Vehicle		7/14/2008	9:00:00 AM	Mouse 1 sniffing On Object 2	1	22
2	2	Drug A	1	7/14/2008	9:00:00 AM	Mouse 1 sniffing On Object 1	0	0
2	2	Drug A	1	7/14/2008	9:00:00 AM	Mouse 1 sniffing On Object 2	2	23
3	3	Drug B	1	7/14/2008	9:00:00 AM	Mouse 1 sniffing On Object 1	2	55
3	3	Drug B	1	7/14/2008	9:00:00 AM	Mouse 1 sniffing On Object 2	1	20
4	4	Drug C	1	7/14/2008	9:00:00 AM	Mouse 1 sniffing On Object 1	1	19
4	4	Drug C	1	7/14/2008	9:00:00 AM	Mouse 1 sniffing On Object 2	1	12
5	1	Vehicle		7/14/2008	9:30:00 AM	Mouse 1 sniffing On Object 1	2	35
5	1	Vehicle		7/14/2008	9:30:00 AM	Mouse 1 sniffing On Object 2	1	25
6	2	Drug A	1	7/14/2008	9:30:00 AM	Mouse 1 sniffing On Object 1	2	123
6	2	Drug A	1	7/14/2008	9:30:00 AM	Mouse 1 sniffing On Object 2	5	119
7	3	Drug B	1	7/14/2008	9:30:00 AM	Mouse 1 sniffing On Object 1	1	13
7	3	Drug B	1	7/14/2008	9:30:00 AM	Mouse 1 sniffing On Object 2	0	0
8	4	Drug C	1	7/14/2008	9:30:00 AM	Mouse 1 sniffing On Object 1	1	36
8	4	Drug C	1	7/14/2008	9:30:00 AM	Mouse 1 sniffing On Object 2	1	17
9	1	Vehicle		7/14/2008	10:00:00 AM	Mouse 1 sniffing On Object 1	2	79
9	1	Vehicle		7/14/2008	10:00:00 AM	Mouse 1 sniffing On Object 2	0	0
10	2	Drug A	1	7/14/2008	10:00:00 AM	Mouse 1 sniffing On Object 1	1	13

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。



The screenshot shows the 'Multi-Task Batch Analyzing List' window. The table below lists the tasks to be analyzed. The 'Task' column contains numbers 1, 2, and 3. The 'Status' column shows 'Ready' for all tasks. The 'Output Folder' column is empty. The 'Experiment' column shows 'Def-HCS-RT' for all tasks. The 'Task' column also contains a 'Task' label and a list of control buttons: 'Add ...', 'Del', 'Clear', 'Save ...', 'Load ...', 'Set Setting ...', and 'LogIn Experiment ...'.

	Video File	Background	Calibration	Settings	Analysis From	To	Status	Output Folder	Experiment	Task
1	HCSDEMO.mpg	HCSDEMO.BMP	HCSDEMO.CLB	HomeCageScan_Sgmt#1_End.SET	13.00	370.00	Ready		Def-HCS-RT	1
2	HCSDEMO.mpg	HCSDEMO.BMP	HCSDEMO.CLB	HomeCageScan_Sgmt#1_End.SET	13.00	370.00	Ready		Def-HCS-RT	5
3	HCSDEMO.mpg	HCSDEMO.BMP	HCSDEMO.CLB	HomeCageScan_Sgmt#1_End.SET	13.00	370.00	Ready		Def-HCS-RT	6

Thank You

