

Ethogram Logging and Analysis – Implementation Strategy

Jeff Muday

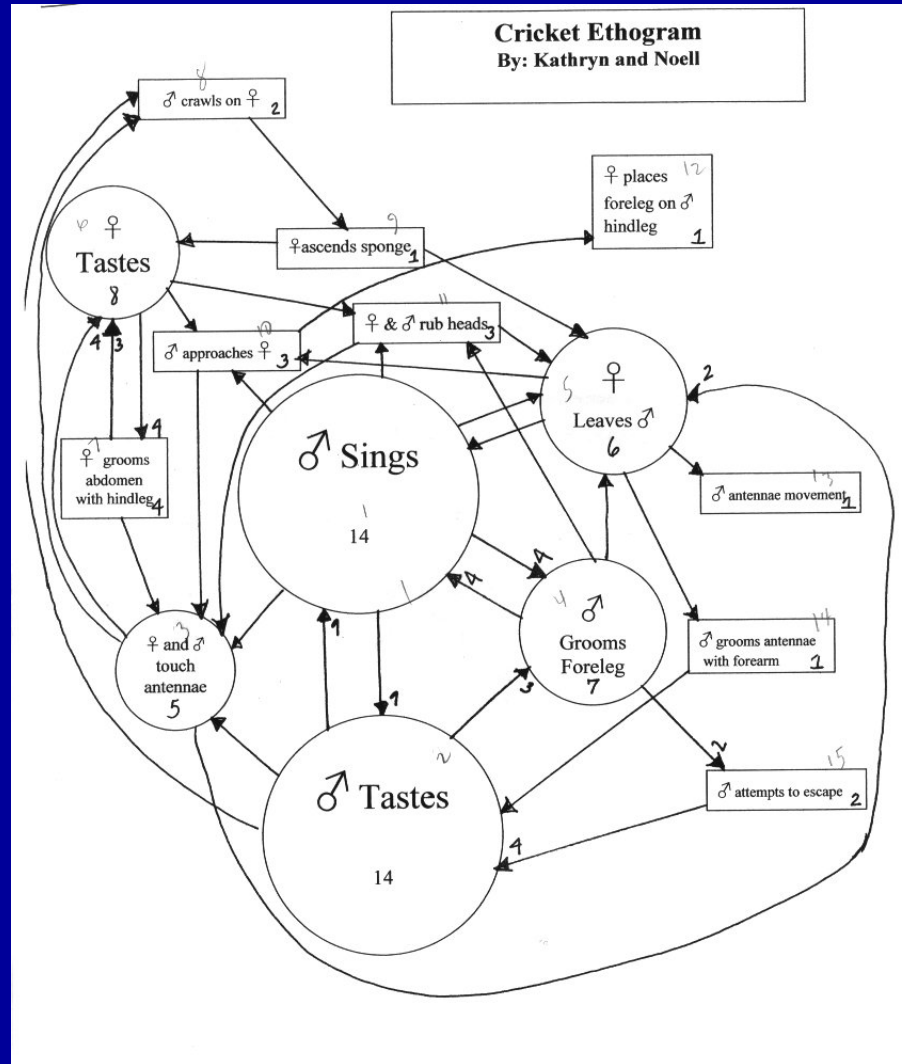
Wake Forest University

ITG Project - Capstone Presentation

Proposal for Collection of Ethograms with PDA Devices

Ethograms are very important in analyzing animal and human behavior patterns. The creation of ethograms requires repetitive logging of observations to written notebooks and eventual conversion to an analyzable file format. Personal Digital Assistants or PDAs are hand-held computers that would allow automation of the data collection task compressing the observation and reporting task into one operation. Implementation of a suite of programs that allows creation of ethograms would be an excellent addition to Wake Forest's Animal Behavior classroom laboratories and would be of high interest to researchers in Psychology, Sociology, and Health and Exercise Science.

A Sample Ethogram



Practical Realization

- William Conner, WFU Biology
 - Generalized Ethogram Logging
 - For upper division Animal Behavior Classes
 - Summer session II, 2003 and future semesters
 - Possible extension to research use



- David Anderson, WFU Biology
 - Specific Ethogram Logging
 - Nest logger I
 - Nest logger II
 - Frequent Nest Visit
 - New programs due in August



- Jeff Muday, WFU Biology
 - Scientific Programmer, Technologist



Symbol 2700 in the Galapagos



Mark Westbrock

Implementation of Ethogram Logger

- Prototype I
 - Created for further discussion of needs/goals
 - Informal requirements document
 - Constructed in Windows Visual Basic
 - Quick
 - understood by Conner, Anderson, and others in dept
- Prototype II
 - PDA Symbol 2700, iPAQ
 - Created to determine feasibility/useability factors
 - Constructed in embedded Visual Basic

Prototype hypothesis/results

- Prediction of minimum code “refactorization” from VB6 prototype
 - FALSE
- Belief that Anderson and his research associates might be able to make real programming changes in the field
 - UNDETERMINED – associates need training
- eVB is platform portable
 - TRUE
- eVB has sufficient performance
 - TRUE

eVB Weakness

- Scripted language
 - Uses pvbload.exe and other DLL support files
 - This becomes a strength in portability
 - Not as “self-contained” as eVC
 - Possible decompilation
- Not Object Oriented!
 - User-defined class modules are not supported in its current incarnation
- Control Arrays not supported
- Object memory leaks!
- VB6 code is only partially portable to eVB
- All variables are variant (not strongly typed)

eVB Strengths

- Easy to code, maintain, modify
- Code `_is_` portable to VB windows
 - Although direct API refs differ somewhat
- Performance is satisfactory for *simple* user interaction
- Code is highly portable between different PDAs and Platforms (Pocket PC and Pocket PC 2002)
- eVB is “free” (methods could be reproduced by other research groups without great investment)
- Access to WinCE API is straightforward

Galapagos environmental logging



Frequent Nest Visit Program

- Research study on time of presence and behavior of known adults and juveniles at particular nesting sites
 - Researcher walks a nest “route” to visit a particular species of bird (WAAL, NZBO)
 - Route is typically completed in less than 1 hour may require between 10-100 nests to be “visited”
 - Researcher notes nest # and band # of adult that is either brooding or non-brooding, or simply indicates that a solo chick is present.



The Login screen...

2003-06-05 13:10

Observer Initials

Time Code

Log Dir

Filename

2003-06-05 13:20

Observer Initials

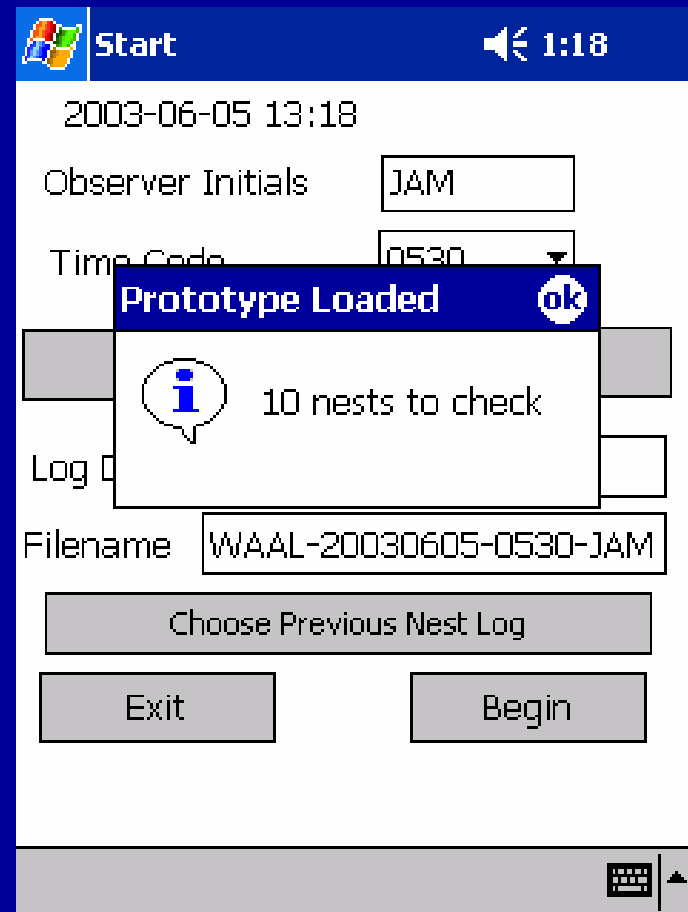
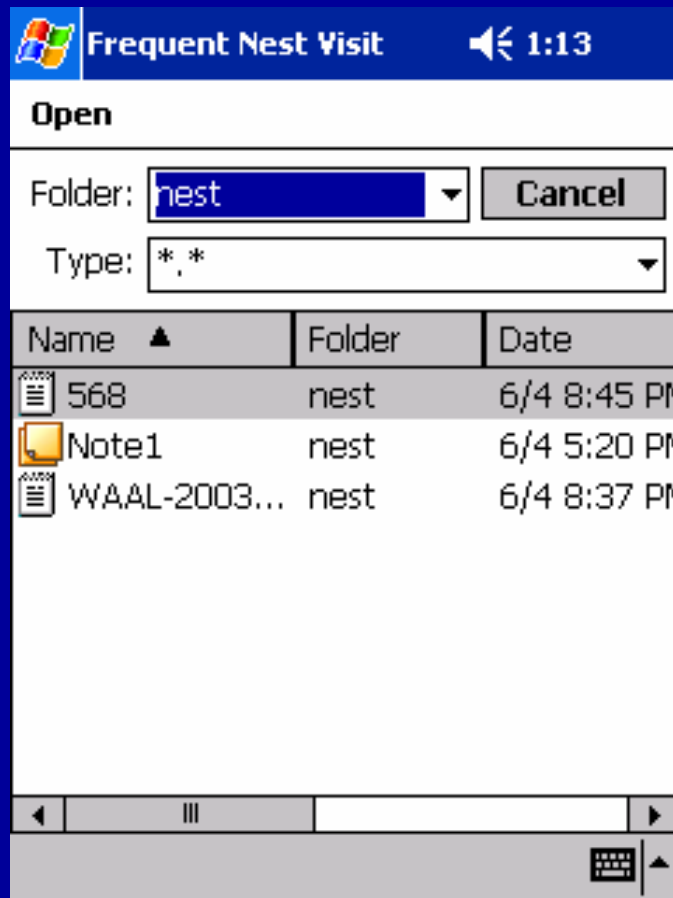
Time Code

Log Dir

Filename

0530
0530
0600
0700
0800
0900
1000
1100
1200

Choosing a previous nest log as a Prototype



Entering the nest number

Start 1:22

Enter Nest Number

1	2	3	Next
4	5	6	Remaining Nests
7	8	9	54
C	0	ESC	56
			39
			59
			58
			45

1:22

Start 1:23

Enter Nest Number

1	2	3	Next
4	5	6	Remaining Nests
7	8	9	54
C	0	ESC	56
			39
			59
			58
			45

1:23



Entering Band # and Behavior

The screenshot shows a software interface for entering bird observation data. At the top, there is a blue header bar with the Windows logo, the text "NEST = 39", a speaker icon, the time "1:26", and a close button. Below the header, the instruction "Enter Band, then Behave Obs" is displayed. A text input field contains the number "457". Below the input field is a grid of buttons for behavior selection. The grid consists of four rows and four columns. The first three columns of each row contain numeric keys (1-9, 0, C, ESC), and the fourth column contains behavior labels (Solo, Normal, Brooding, ReDo). At the bottom right of the interface, there is a keyboard icon and a mouse cursor icon.

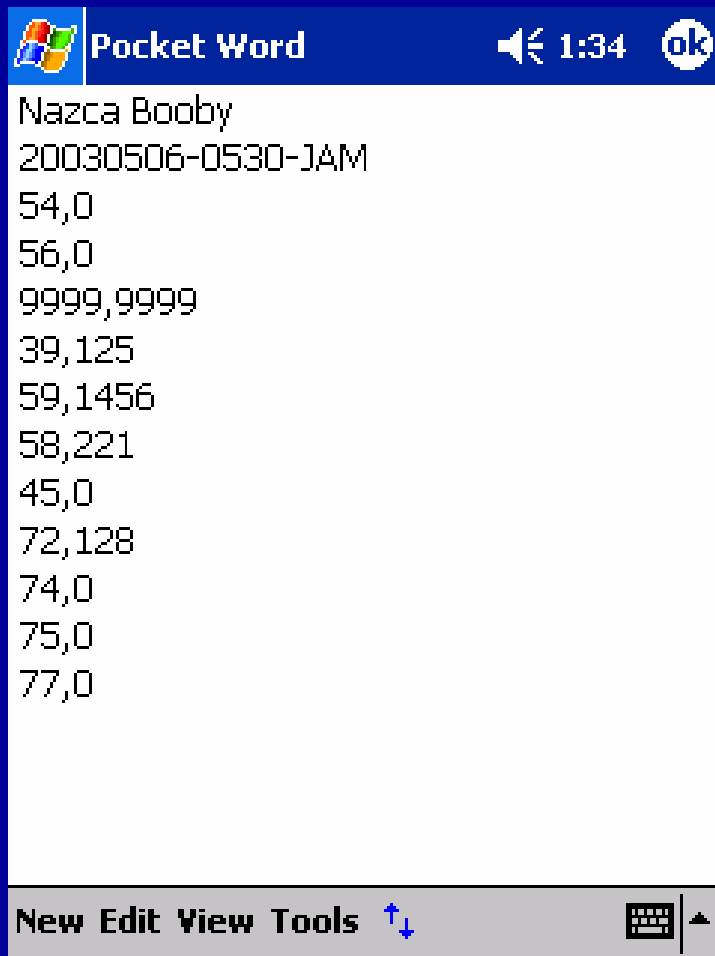
1	2	3	Solo
4	5	6	Normal
7	8	9	Brooding
C	0	ESC	ReDo

The behavior selectors are very simple:

We only care to know if a SOLO chick is present or if a NORMAL parent is present, or if a BROODING parent is present.

If the last entry was a mistake, we can press REDO to indicate this situation.

Very Simple Log Format!



This simple text based log will be imported into Excel as a CSV file.

The simplicity yields a great deal of flexibility.

Various macros may construct an alternate “worksheet” used for data correlation in SPSS, Sigmaplot, or Statistica.

Nest Log I

- Original Ethogram Logger
- Designed for specific logging task
- Developed with VC++ using WinCE SDK
- Using MFC
- Very simple
- Used by Dr. Kate Huyvaert and Dr. Howard Townshend



Nest Log II

- Based on the Conner Ethogram program
- Flexible definition of behavior buttons
- Allows addition/modification/deletion of behavior keys
- Allows multiple pages of behavior keys
- Specific modifications added for Jill Awkerman's research project

Nest Log II

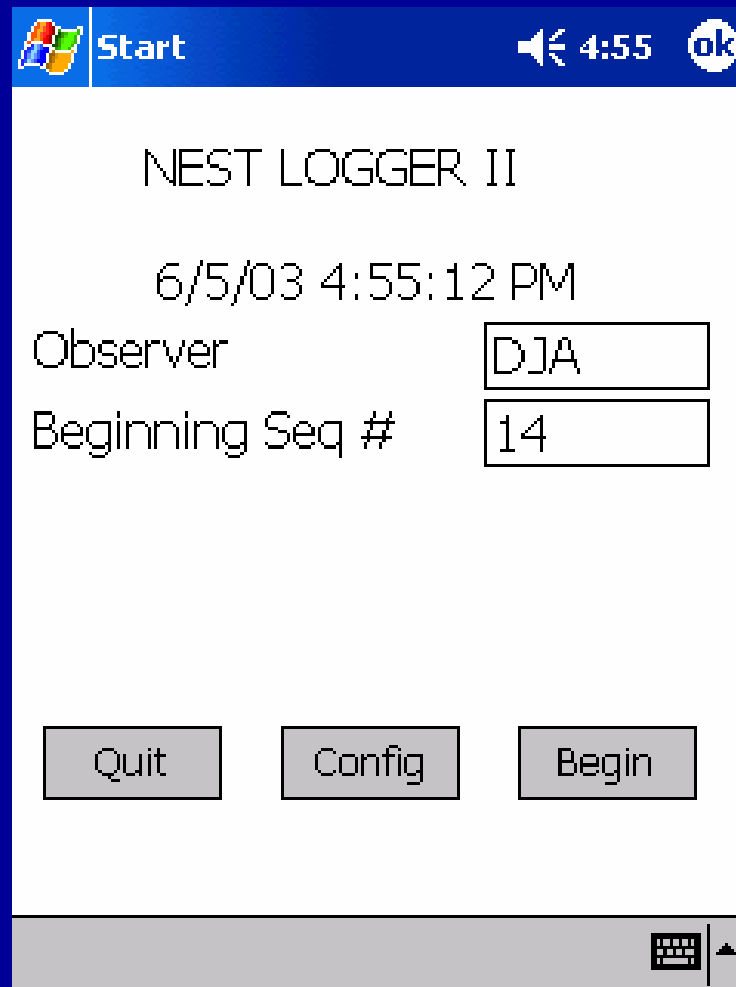
Program Logs the interaction of Parents and Chicks

- Parents have 9 definite behaviors
- Chicks have 9 definite behaviors
- 18 behaviors were mapped to 20 behavior buttons
- 10 behavior buttons were used per page (2 repeated behavior buttons)
- Possibility of “field re-definition” of behavior matrix



Jill Awkerman

Login screen



The image shows a Windows XP-style login screen for a program named 'NEST LOGGER II'. The window title bar is blue and contains the Windows logo, the word 'Start', a speaker icon, the time '4:55', and an 'ok' button. The main content area is white and displays the program name 'NEST LOGGER II' and the current date and time '6/5/03 4:55:12 PM'. Below this, there are two input fields: 'Observer' with the value 'DJA' and 'Beginning Seq #' with the value '14'. At the bottom of the window, there are three buttons: 'Quit', 'Config', and 'Begin'. The taskbar at the bottom right shows a keyboard icon and a mouse cursor.

Start 4:55 ok

NEST LOGGER II

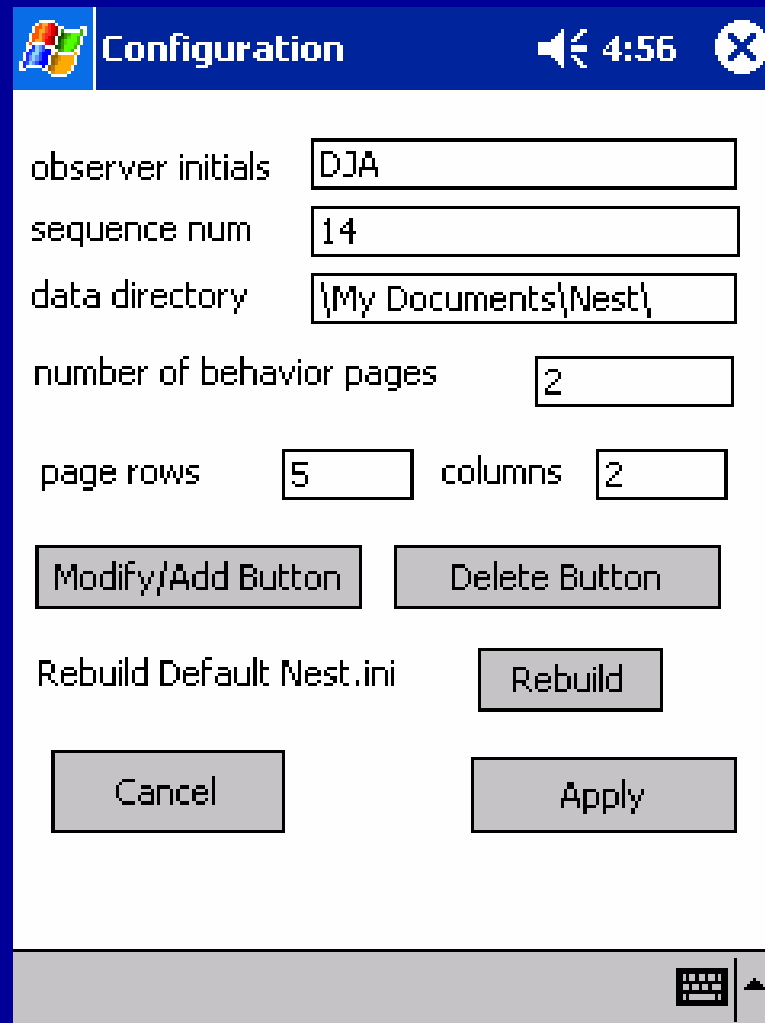
6/5/03 4:55:12 PM

Observer

Beginning Seq #

Quit Config Begin

Configuration Screen



The image shows a Windows-style configuration dialog box titled "Configuration". The window has a blue title bar with the Windows logo on the left, the title "Configuration" in the center, and a volume icon, the time "4:56", and a close button on the right. The main area is white and contains several input fields and buttons. The fields are: "observer initials" with the value "DJA", "sequence num" with the value "14", "data directory" with the value "{My Documents}\Nest\"}, "number of behavior pages" with the value "2", "page rows" with the value "5", and "columns" with the value "2". Below these fields are two buttons: "Modify/Add Button" and "Delete Button". Further down is a label "Rebuild Default Nest.ini" followed by a "Rebuild" button. At the bottom are "Cancel" and "Apply" buttons. The bottom right corner of the dialog box shows a keyboard icon and a small upward-pointing arrow.

observer initials

sequence num

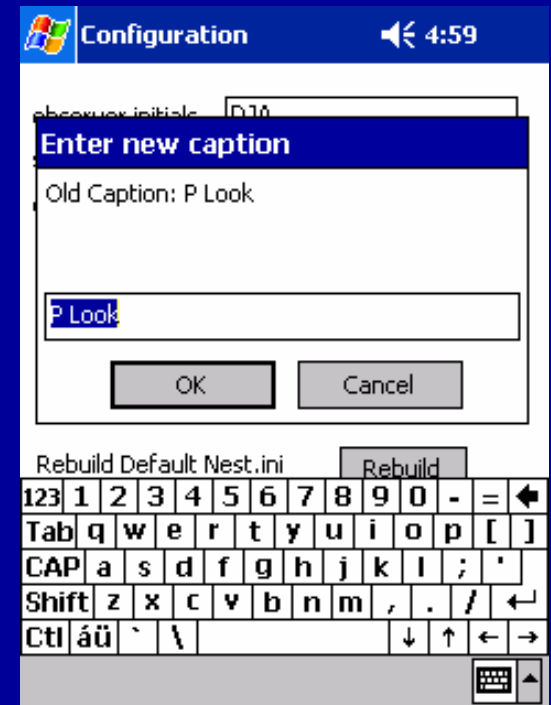
data directory

number of behavior pages

page rows columns

Rebuild Default Nest.ini

Add/Modify Button Selection



Delete Button Selection



Behavior Logging, finally!

Start 5:16

P(541) T(17:16:21) MORE

P Look	C BillUp
P Bill Ct	C Poke
P AlloPn	C Wing
P Vocal	C Vocal
P Offer	Feed

P(541) A(P Vocal) T(17:16:14)

Exit ReDo New Par

Event # 17

Keyboard icon

Start 5:17

P(541) T(17:17:10) MORE

P Appr	C Appr
P Stnd	P Offer
P S O C	Snarf
P Rock	Blurf
P Walk	C Walk

P(541) A(P Vocal) T(17:16:14)

Exit ReDo New Par

Event # 17

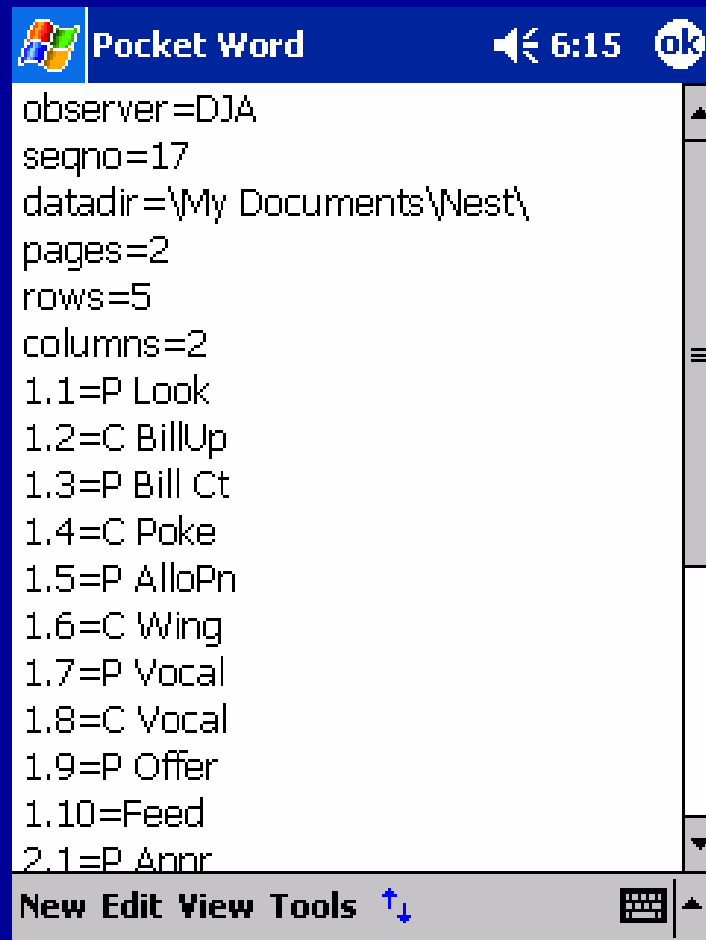
Keyboard icon

Parent Band # Entry

The image shows a screenshot of a Windows XP Start menu application. The window title bar is blue and contains the Windows logo, the word "Start", a speaker icon, the time "5:24", and a close button. The main content area is white and features a text input field at the top left containing the number "541". To the right of the input field is a "Clear" button. Below the input field is a numeric keypad with buttons for digits 1-9, 0, and function keys M, F, and Ent. The Ent key is a tall vertical button. At the bottom left of the keypad area is a "Cancel" button. The bottom of the window has a grey taskbar with a keyboard icon and an upward-pointing arrow.

Start			5:24	✕
541			Clear	
1	2	3	Ent	
4	5	6		
7	8	9		
M	0	F		
Cancel				

INI File plain-text is simple and hand-editable



The screenshot shows the Pocket Word application window. The title bar reads "Pocket Word" with a volume icon and "6:15" and an "ok" button. The main content area contains the following text:

```
observer=DJA
seqno=17
datadir=\My Documents\Nest\
pages=2
rows=5
columns=2
1.1=P Look
1.2=C BillUp
1.3=P Bill Ct
1.4=C Poke
1.5=P AlloPn
1.6=C Wing
1.7=P Vocal
1.8=C Vocal
1.9=P Offer
1.10=Feed
2.1=P Annr
```

The bottom status bar shows "New Edit View Tools" with a scroll bar and a keyboard icon.



The screenshot shows the Start application window. The title bar reads "Start" with a volume icon and "5:16" and a close button. The main content area displays:

P(541) T(17:16:21) MORE

P Look	C BillUp
P Bill Ct	C Poke
P AlloPn	C Wing
P Vocal	C Vocal
P Offer	Feed

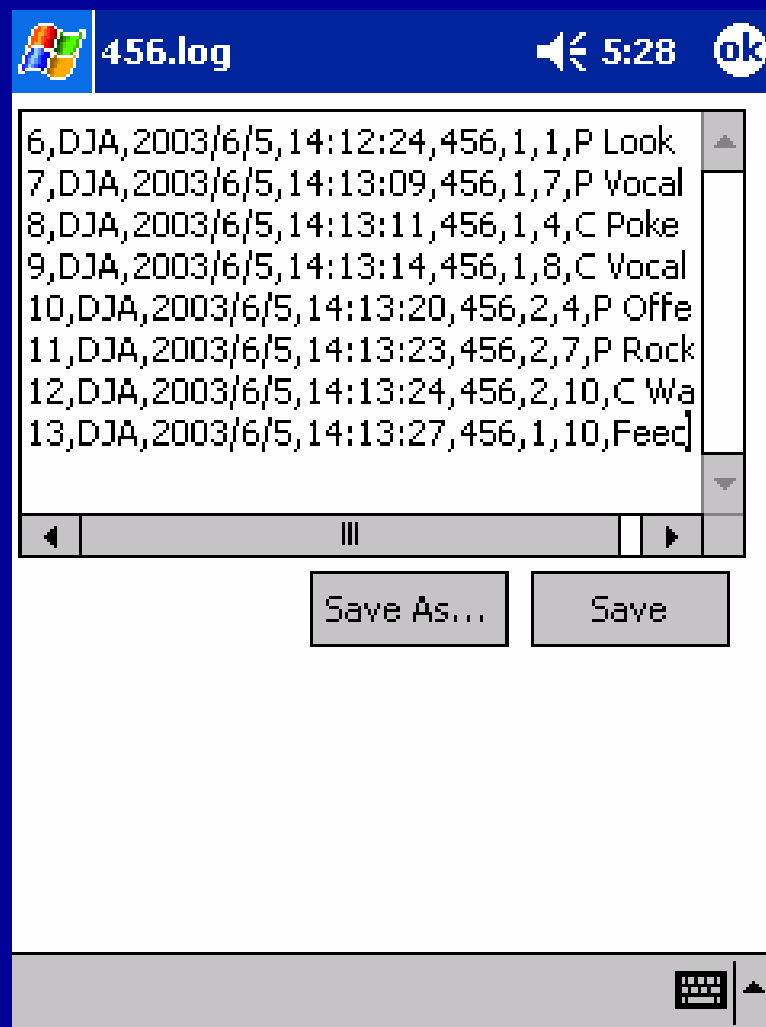
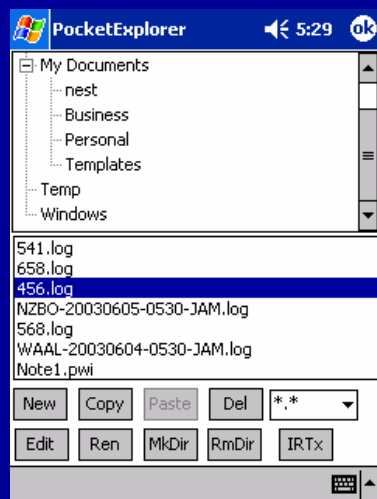
P(541) A(P Vocal) T(17:16:14)

Exit ReDo New Par

Event # 17

The bottom status bar shows a keyboard icon and a scroll bar.

Simple Log File!



Did it Work?



Egad, here's that kid with the PDA again!

Waiting on the results

- Both logger programs appear to be working very successfully
- Much data has been collected
- Terri McManness and Mark Westbrock defining a new behavior templates for their research beginning in the near future



What is left to do?

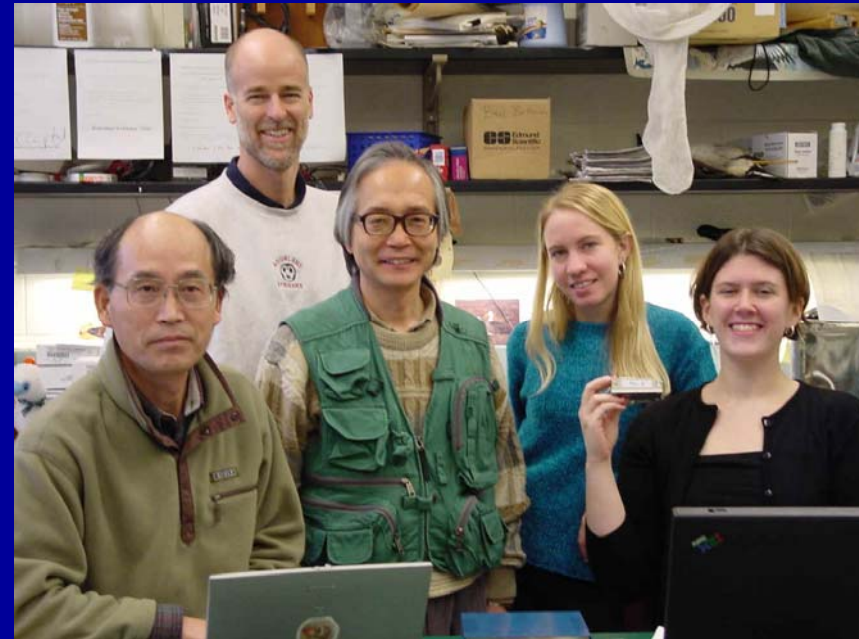
- Jay Dominick has suggested a “Wizard” to define the behavior buttons/pages
 - Fairly easy, small project
- Analysis programs of logs
 - Histogram of behavior occurrences (easy)
 - Histogram of behavior frequency/duration (easy)
 - State transition matrices (moderate)
 - Directed Acyclical graphs with weighted edges (difficult)
- Rebuilding the program in eVC
 - Are we finished yet?
- Can this be packaged into a “turnkey” laboratory tool for K-12 biology lab/classroom?

Other projects...

- Documentation ☹ and publication 😊
- GPS module/class for coupling with eVB and eVC

The Anderson Laboratory is currently collaborating with colleagues from the University of Tokyo and Shizuoka University using GPS technology for Albatross research

Akira Fukuda, Dave Anderson, Hito Higuchi, Cindy Gillikin, and Dana Wood, holding GPS unit. Kate Huyvaert (now at UM) is also participating.



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