

turning knowledge into practice

Automated Testing of the Census CFU Instrument

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RTI International is a trade name of Research Triangle Institute

Outline

- Introduction
- RoboTools
- CFU
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- Summary

Introduction

- RTI International has developed a set of software tools, called RoboTools, to perform automated testing of the 2005 and 2006 Census Coverage Follow Up (CFU) instruments

RoboTools Utilities

- RoboCAI --- script reader that sends script items to a Blaise instrument as keystrokes
- RoboCompare -- comparison utility that compares script, as run, to the data in the Blaise database or an extracted ASCII file
- RoboWalk -- random walk tool to walk through a Blaise instrument
- AuditToRoboCAI -- a utility to convert Blaise audit trail files to RoboCAI format scripts
- Audit.dll -- a modified version of the standard Blaise-supplied audit trail dynamic link library that provides the synchronization between Blaise and RoboCAI

RoboCAI

- Written using WinBatch, a batch language interpreter for Windows.
- Works with Blaise 4.5 & 4.6
- Uses a modified Blaise audit trail DLL, audit.dll

RoboCompare

- Visual Basic utility program that uses the Blaise API to compare the script input to the Blaise data.
- Enhanced script file – used for comparing the Blaise data to the input script. It contains the script field name, actual, fully-qualified field name and the response value sent to the Blaise instrument.

What is CFU?

- Survey name: Coverage Follow-Up, Blaise Instrument for the 2006 Field Test
- Client: Census Bureau
- Purpose: To resolve discrepancies and fill in missing data for the 2010 Decennial Census
- Blaise programming is being done by RTI
- Data collection will be done by the Census Bureau
- RoboCAI work was done at RTI on development versions

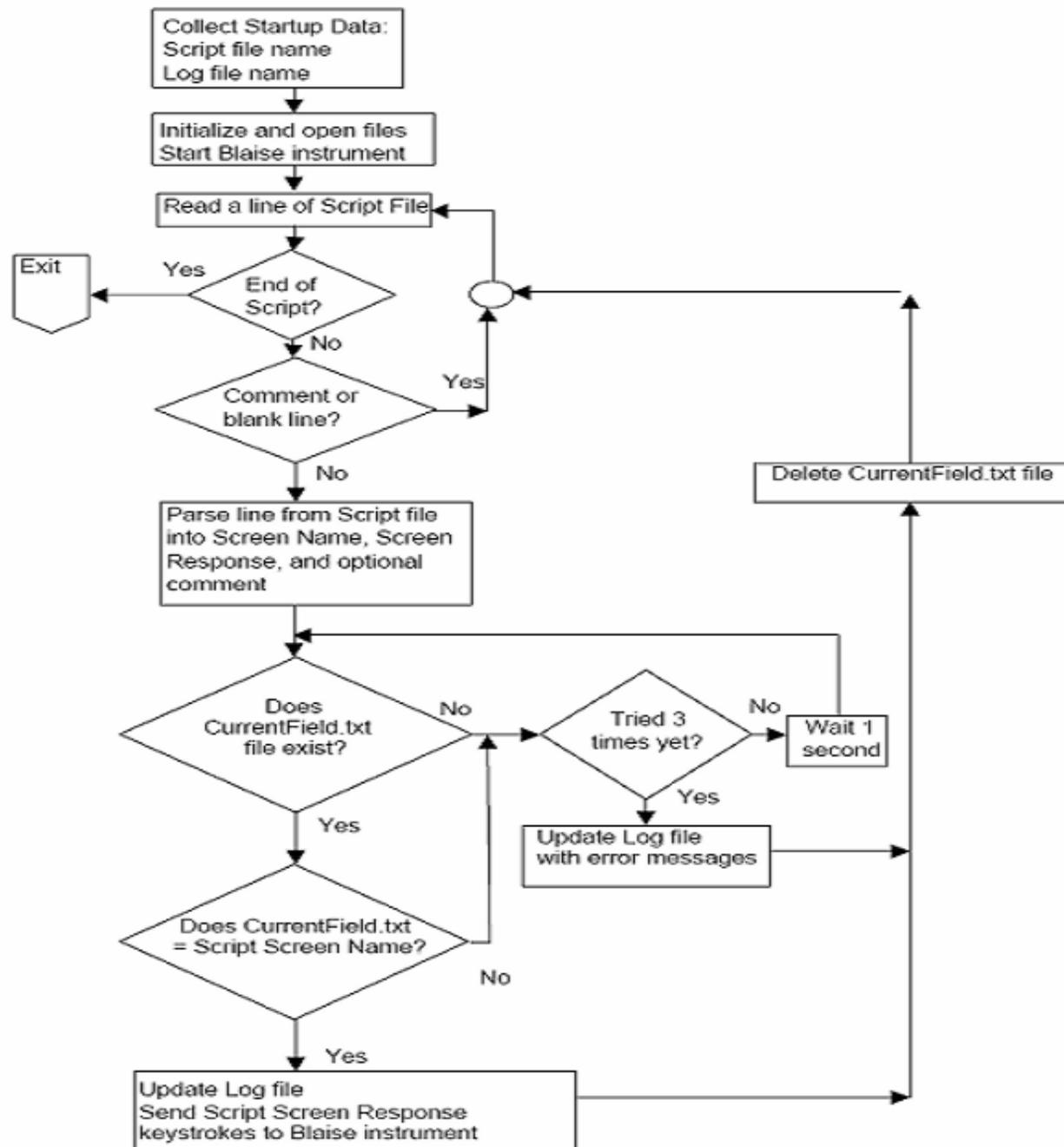
Why Automated Testing?

- Automating and extending the *manual* testing process currently in use
- Detailed test cases, including predictable "expected results", which have been developed from specifications and design documentation
- A standalone test environment, including a test database that is restorable to a known constant, such that the test cases are able to be repeated each time that there are modifications made to the application
- Tools to feed test cases into the test environment, document the tests, record results and provide analysis

Sequence of events

- RoboCAI program prompts the user for the name of a script file containing response data
- Prompts the user for the name of a log file to which diagnostic information is written.
- Starts CAI instrument and reads the script file
- RoboCAI then sends the keystrokes representing the response in the script file to each screen of the CAI instrument.
- RoboCAI writes out diagnostic information to the log file

Figure 1



RoboCAI synchronization

- RoboCAI and the CAI instrument run in parallel
- RoboCAI must wait for the CAI instrument to complete processing prior to proceeding to the next screen
- RoboCAI must allow the Blaise audit trail dll enough time to open, write into, and close the currentscreen.txt file before it can check to see if it is still tracking the flow through the questionnaire correctly.
- RoboCAI can also be run in batch mode for more than one script.

Using RoboCAI with the Census CFU Instrument

- Test scripts were written based on scenarios taken from the CFU test plan.
- 72 scenarios tested with the last version of the CFU instrument
- Test data preloaded into the instrument with a case record for each scenario
- Using RoboCompare, the Blaise data is compared to the script entries to confirm that data matches the script responses.
- Output data is then analyzed for consistency with the expected results specified in the test plan.

CFU Example Scenario

3	A, H – right HH, RESPWHO = yes, RESPWHONAME from roster, CFRESPAVAIL = yes, CINTRO = 1, F10EXIT, F10LANG (MARK =11, MARKTWO = 0, OUTCOME=<blank>, OUTCOME_SUBTYPE = <blank>)
---	---

RIGHTHH “Have I reached the {fill LAST NAME} household?” : Yes, No

RESPWHO “Do you know who completed the census form or interview?” : Yes, No

RESPWHONAME “Who is that person?”

FULL NAME of P1 through Pn where age >15 or blank,

NOHH, “Respondent who filled out census form and is not living at Household”

NO15, “Respondent who filled out census form and is under 15”)

CFRESPAVAIL “May I speak to {fill FULL NAME of name selected in RESPWHONAME}?” :

Yes, “Yes, (fill FULLNAME of RESPWHONAME) is available”,

No1 “No, respondent no longer lives here”,

No2, “No, respondent is currently not available”)

CINTRO Intro screen to Housing Unit Questions : 1 to proceed

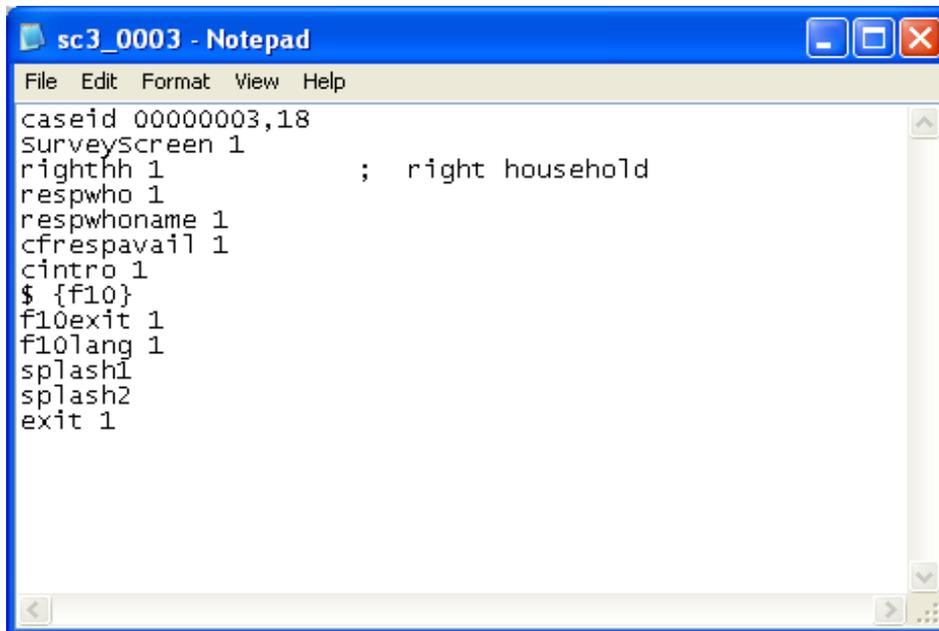
F10EXIT Break off “Thank you for your time. I would like to set an appointment for me to call back ...” : 1 to proceed

F10LANG “In what language did you conduct the interview?” : English, Spanish, Some Other Language

CFU Example Scenario

3 **A, H** – right HH, RESPWHO = yes, RESPWHONAME from roster, CFRESPAVAIL = yes, CINTRO = 1, F10EXIT, F10LANG (MARK =11, MARKTWO = 0, OUTCOME=<blank>, OUTCOME_SUBTYPE = <blank>)

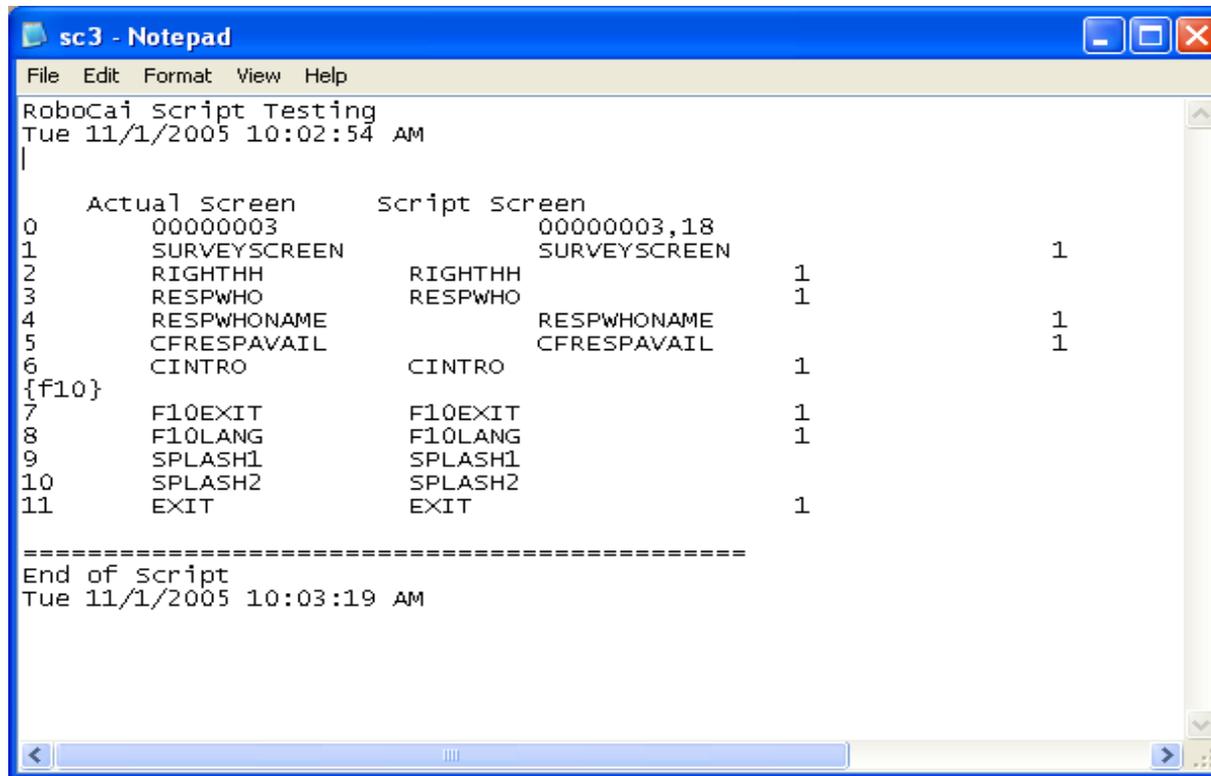
Corresponding Script



```
sc3_0003 - Notepad
File Edit Format View Help
caseid 00000003,18
SurveyScreen 1
righthh 1           ; right household
respwho 1
respwhoname 1
cfrespavail 1
cintro 1
$ {f10}
f10exit 1
f10lang 1
splash1
splash2
exit 1
```

Census CFU – Automated Testing

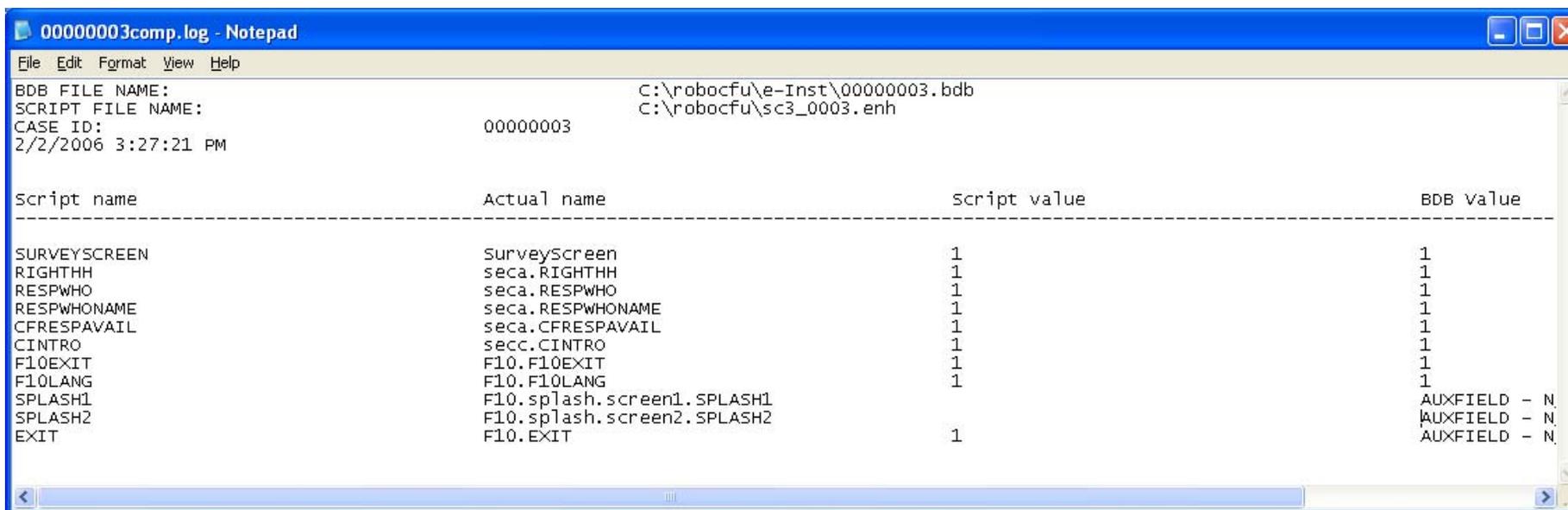
Example RoboCAI output log



```
sc3 - Notepad
File Edit Format View Help
RoboCAI Script Testing
Tue 11/1/2005 10:02:54 AM
|
Actual screen      Script screen
0      00000003      00000003,18
1      SURVEYSCREEN      SURVEYSCREEN      1
2      RIGHTHH      RIGHTHH      1
3      RESPWHO      RESPWHO      1
4      RESPWHONAME      RESPWHONAME      1
5      CFRESPAVAIL      CFRESPAVAIL      1
6      CINTRO      CINTRO      1
{f10}
7      F10EXIT      F10EXIT      1
8      F10LANG      F10LANG      1
9      SPLASH1      SPLASH1
10     SPLASH2      SPLASH2
11     EXIT      EXIT      1
-----
End of Script
Tue 11/1/2005 10:03:19 AM
```

RoboCompare Output Log

- Comparison process documents the test and highlights any differences between script data and Blaise data.



```
00000003comp.log - Notepad
File Edit Format View Help
BDB FILE NAME: C:\robocfu\e-Inst\00000003.bdb
SCRIPT FILE NAME: C:\robocfu\sc3_0003.enh
CASE ID: 00000003
2/2/2006 3:27:21 PM

Script name      Actual name      script value     BDB Value
-----
SURVEYSCREEN     SurveyScreen     1                1
RIGHTHH          seca.RIGHTHH     1                1
RESPWHO          seca.RESPWHO     1                1
RESPWHONAME      seca.RESPWHONAME 1                1
CFRESPAVAIL      seca.CFRESPAVAIL 1                1
CINTRO           secc.CINTRO      1                1
F10EXIT          F10.F10EXIT      1                1
F10LANG          F10.F10LANG      1                1
SPLASH1          F10.splash.screen1.SPLASH1
SPLASH2          F10.splash.screen2.SPLASH2
EXIT             F10.EXIT         1                AUXFIELD - N
                                     AUXFIELD - N
                                     AUXFIELD - N
```

Lessons Learned

- RoboCAI does not test screen text or layouts
- Still a need for manual testing
- Scripts are sensitive to instrument change
- Writing scripts takes time and patience

Summary

- ❖ For our purposes, RoboCAI has proved to be effective in testing the CFU instrument. While not intended as a means of checking the screen and answer text of the instrument, it does provide a means for checking the correctness of routing and the resulting data.

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Thank You

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Copies of these slides can be found at:

<http://www.rti.org/fedcasisc>