Help, It Looks Confusing :

GUI Task Automation Through Demonstration and Follow-up Questions

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Program me (your computer) by Demonstration.
But then answer my questions please,
So I'll operate on the right GUI elements.

World Before HILC

	Domain Independent	No Programming Skill Required	Deal with Non-linear Tasks
Sikuli[1]	✓	✗	✓
Sikuli Slides[2]	✓	✓	✗
Koala[3], CoScriptor[4]	✗	✓	✓
Sheepdog[5], Familiar[6]	✗	✓	✓
HILC	✓	✓	✓

User Inputs

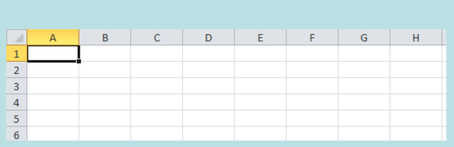
Phases/Tasks	Linear	Looping	Monitoring
Demonstration	Normal	+Signal	+Signal
Teaching	Supporters	Positives False positives Supporters	Visual Cues
Running	Execute	Execute	Execute

Evaluation

Scenario	Basic Actions + Typing: Click	Click Drag	Double Click	Right Click	Typing	Transcription: Sikuli Slides	Transcription: Our	Reproduction: Sikuli Slides	Reproduction: Our	Demonstration Time VS Refining Time (average): Sikuli Slides	Demonstration Time VS Refining Time (average): Our
1 Mute Audio playback (Linear)	2	0	0	0	0	✓	✓	✓*	✓	10s/49s	10s/27s
2 Turn on High-Contrast-Mode (Linear)	6	1	0	0	0	✓*	✓	✓**	✓	27s/10m	27s/170s
3 Remote access with Team Viewer (Linear)	11	0	0	0	4	✓*	✓	✗	✓	40s/∞	40s/4m
3.2 Remote access with Team Viewer (Linear)	13	0	0	4	0	✓*	✓	✗	✓	37s/∞	37s/7m
4. Skip YouTube ads (Monitoring)	1	0	0	0	0	✗	✓	✗	✓	N/A	10s/5.5m
5. Close YouTube ads (Monitoring)	1	0	0	0	0	✗	✓	✗	✓	N/A	12s/6.9m
6. Create slides out of jpgs folder (Looping)	2x	1x	0	0	0	✗	✓	✗	✓	N/A	35s/10m
7. Create spreadsheet of filenames (Looping)	4x	2x	0	0	4x	✗	✓	✗	✓	N/A	60s/6.6m
8. Create BibTex from spreadsheet (Looping)	9x	0	0	0	8x	✗	✓	✗	✓	N/A	86s/12.5m
9. Move MSWord files to a folder (Looping-Video)	4	1x	0	2	0	✗	✓	✗	✓	N/A	25s/**22m**

Table 1. User study on our system compared to Sikuli Slides. Scenario 3.2 is an alternative way to perform Scenario 3, without pressing shortcut key combinations that Sikuli Slides is known to be missing. Nevertheless, we eventually realized that Sikuli Slides isn't detecting the right click actions either. (✓= successful, ✓* = partially successful, ✓ = can be successful with guidance from the operator, ✗= can not succeed at the task at all). x represents the number of repeated loops needed to complete the task. Please note that 90% of the refining time for Task 9 is offline - devoted to the time spent on processing video to produce the log-file.**

Supporters

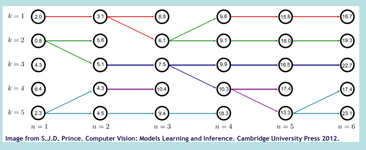


The supporters are context patterns that have certain offsets to the target pattern. Some target patterns need help from supporters to distinguish them. For example, row and column names in a Microsoft Excel spreadsheet distinguish similar looking cells, or field names distinguish similar looking textboxes in a webpage.

Flow

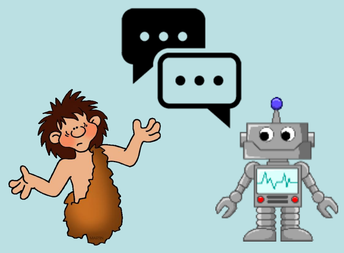
User demonstration

Unified Log-file

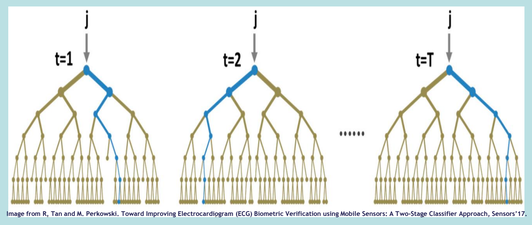


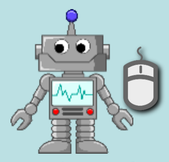
Viterbi Algorithm

Sequence of Basic Actions



Interactive Training of Pattern Detectors





Running the generated script

Limitations

- HILC cannot scroll and does not understand off-screen objects.
- Loops must be simple: one iterator with the remaining step unchanged.
- HILC is unaware of system state, so goes slowly to allow OS to keep up.

References

1) T. Yeh, T.H. Chang, and R. C Miller. 2009. Sikuli: Using GUI Screenshots for Search and Automation. UIST '09.
2) Sikuli Slides. http://slides.sikuli.org/. 2014. Accessed: 14th October, 2016.
3) G. Little, T. A. Lau, A. Cypher, J. Lin, E. M. Haber, and E. Kandogan. 2007. Koala: Capture, Share, Automate, Personalize Business Processes on the Web. CHI '07.
4) G. Leshed, E. M. Haber, T. Matthews, and T. Lau. 2008. CoScripter : Automating & Sharing How-To Knowledge in the Enterprise. CHI '08.
5) V. Castelli, L. Bergman, T. Lau, and D. Oblinger. 2010. Sheepdog, Parallel Collaborative Programming-by-Demonstration. Knowledge-Based Systems.
6) G. W Paynter. 2000. Automating Iterative Tasks with Programming by Demonstration.

Project Page : http://visual.cs.ucl.ac.uk/pubs/HILC/

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