HCI and IDEs for Children

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Paper Citation

- Title: “Using HCI Techniques to Design a More Usable Programming System”
- Authors:
  - John Payne, Brad Myers, and Leah Miller
  - Computer Science Department and Human Computer Interaction Institute
  - Carnegie Mellon University
- Proceedings IEEE 2002 Symposia on Human Centric Computing Languages and Environments
- Cited 141 times, Google Scholar

Abstract/Introduction

- Authors developed HANDS, an IDE for children with a focus on usability
- Target audience is children 5th grade and above
- Environment can be used to create animations/simulations
  - More similar to graphic and interactive environments the audience uses
  - Compared to textual, “Hello World” as traditional introduction to programming

Related Works

- Logo
  - First language written specifically for children
  - Introduced turtle graphics
- Boxer
  - Introduced graphical programming, windows
- ToonTalk
- AgentSheets
- SmallTalk/Squeak

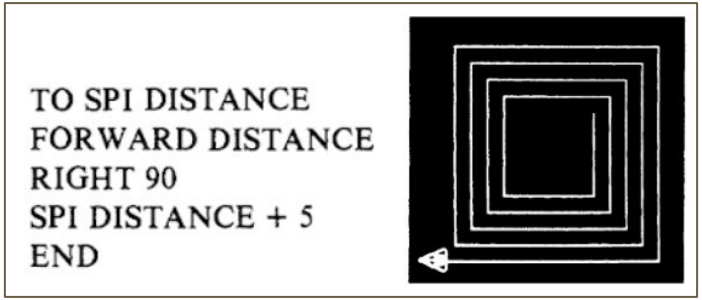


Image credit: *Mindstorms*, Seymour Papert, 1980

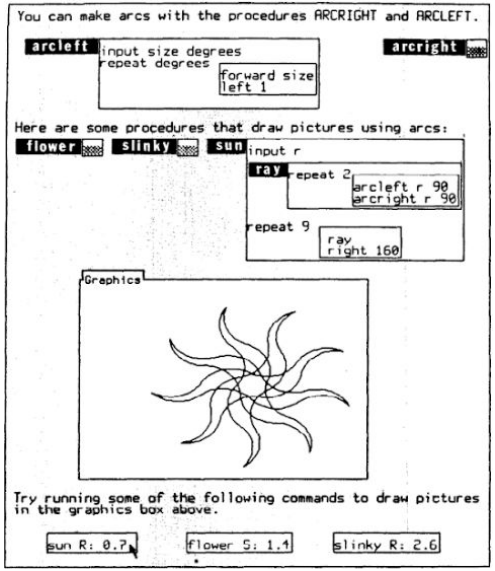


Image credit: MIT Media, 1986

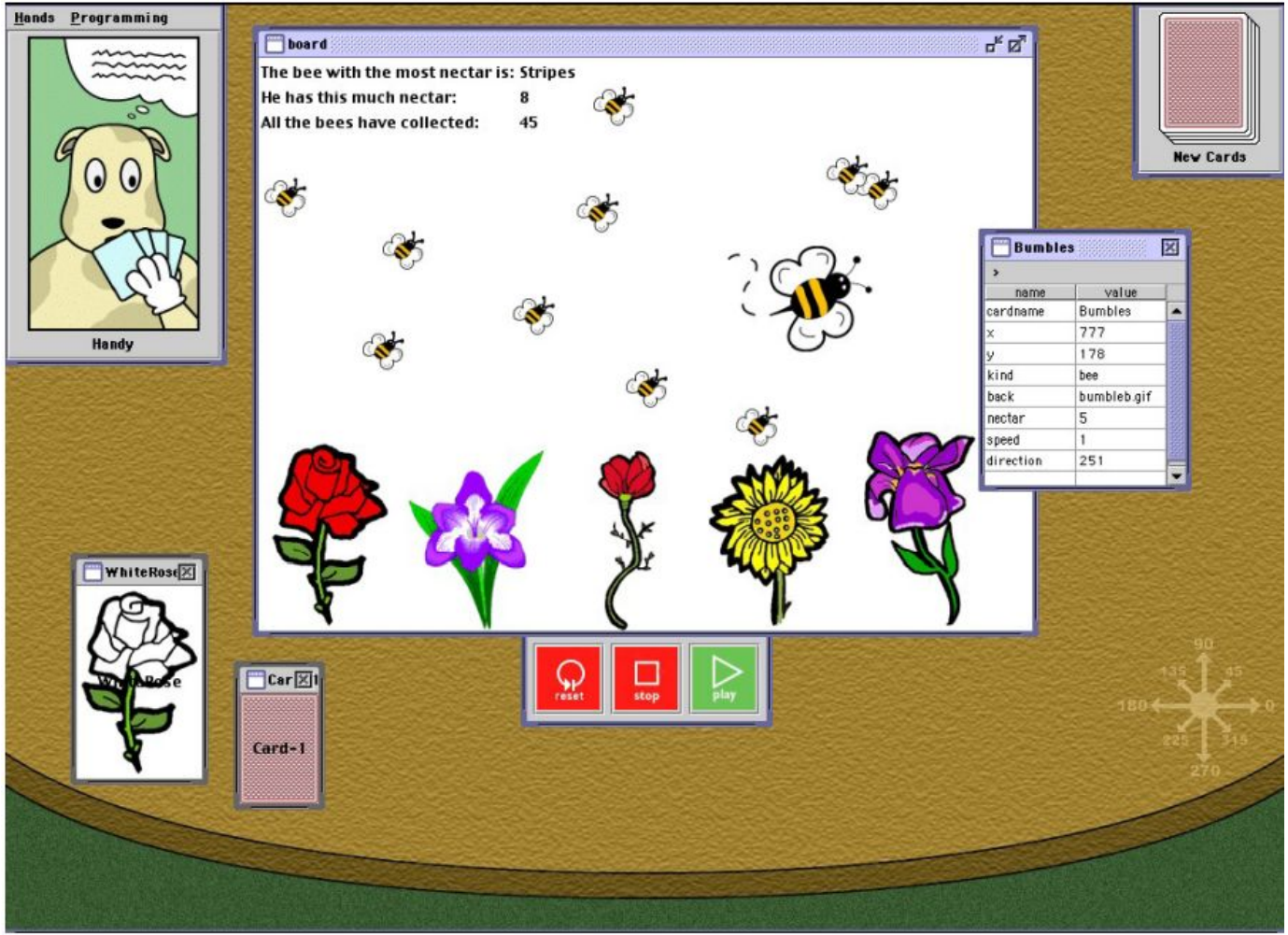
Methodology- The HANDS System

HCI Goals:

- Close mapping between solution and code representation
- Design environment and language in tandem
- Uses hybrid visual/textual
  - Based on observations of non-programmers solving problems
  - Context sensitive menus
- “Speak the user’s language”
  - Uses natural language style for arithmetic
  - Ignores the word “the” anywhere in code

Methodology- The HANDS System

- System automatically inserts terminators, all use “end” command
- Minimal punctuation
- Design principle of visibility applied to variables/scope
  - Data kept in global “cards”
  - Always visible
  - Can import cards from other programs
- Event based
- Dynamic typing
- Fully supports aggregate operations
- Query matching instead of data structures


Hands Programming
Handy
board
The bee with the most nectar is: Stripes
He has this much nectar: 8
All the bees have collected: 45
New Cards
Bumbles
name
value
cardname
Bumbles
x
777
y
178
kind
bee
back
bumbleb.gif
nectar
5
speed
1
direction
251
WhiteRose
Car
Card-1
reset
stop
play
90
45
135
180
0
225
315
270

Results- User Study

3 features evaluated:

- Queries
- Aggregate operations
- High visibility of data

Created two versions of the software, one with and one without

Tested with 23 5th grade volunteers, with no prior experience

Students were much more successful using full version

Future Work/Conclusion

- Results not tested against effectiveness of other systems
- Extended complexity/generalizability
- HCI factors found to make significant impact