When Visual Programs are Harder to Read than Textual Programs

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Introduction

Previous study: Visual language study (LabView) which express conditionals as ‘forward’ structures or ‘backward’ structures

Use previous study for visual and textual programming

Claim: the structure of the graphics in the visual programs is harder to scan than in the text version.
(a) Reports results from a further sample of electronics designers, thoroughly familiar with the underlying metaphor of LabView
(b) Presents full analyses
(c) Relates the findings to the ‘match-mismatch’ hypothesis and the ‘cognitive fit’ hypothesis
(d) presents a simple model of information-gathering from VPLs and TLs which is sufficient to account for the results
Sequential Structure - Nest-INE (Working forwards)

```python
if high:
    if wide:
        if deep: weep
        not deep:
            if tall: weep
            not tall: cluck
            end tall
        end deep
    not wide:
        if long:
            if thick: gasp
            not thick: roar
            end thick
        not long:
            if thick: sigh
            not thick: gasp
            end thick
        end long
    end wide
not high:
    if tall: burp
    not tall: hiccup
    end tall
end high
```
Circumstantial Structure - And / Or (Working backward)

- howl: if honest & tidy & (lazy | sluggish)
- laugh: if honest & tidy & ~ lazy & ~ sluggish
- whisper: if honest & ~ tidy & (nasty & greedy | ~ nasty & ~ greedy)
- bellow: if honest & ~ tidy & nasty & ~ greedy
- groan: if honest & ~ tidy & ~ nasty & greedy
- mutter: if ~ honest & sluggish
- shout: if ~ honest & ~ sluggish
Study
# Part 1 - Forward & Backward Questions

<table>
<thead>
<tr>
<th>OUTCOME</th>
<th>TRUE</th>
<th>FALSE</th>
<th>IRREL</th>
<th>TRUE</th>
<th>FALSE</th>
<th>IRREL</th>
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<tbody>
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<td>high</td>
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</tbody>
</table>

**IS:**
- high
- tall
- thick

**IS NOT:**
- wide
- deep
- long

- weep
- cluck
- gasp
- roar
- sigh
- gasp
- burp
- hiccup
Part 2 - same-different judgements

• In Part 2 of the study two programs were presented side by side, and the subject responded either Same or Different

• By mousing a button.
Results
Part 1 - Forward & Backward Questions

(a) The two Graphics notations (Boxes and Gates):

(b) The two Text notations (Nest-INE and And/Or):
Part2-same-different judgements

effect of Mode:
Comparing two textual notations was fastest; comparing two graphical notations was slowest. The difference is surprisingly great.

effect of Structure:
The comparisons in which both notations were Sequential were slightly faster than those in which one or both were Circumstantial.
Conclusion

• The study of cognitive processes involved in understanding graphs and tables
• The information structure of the graph must also be considered.
• In cases like these where the graphical structure contains ‘knots’ but the textual version does not, the supposed advantages of graphics over text will prove illusory
Open Questions

• Overall reaction to the paper

• Are the claim convincing?

• How Visual programming affects your performance in terms of time? Is it faster?