JOSS: CONVERSATIONS WITH THE JOHNNIAC OPEN-SHOP SYSTEM

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Since January 1964, staff members of The RAND Corporation have been directing JOSS (Johnniac Open-Shop System) in a high-level algebraic language. JOSS monitors ten remote typewriter consoles and serves up to eight users concurrently by time-sharing its efforts among them. It is an experimental system, designed to demonstrate some of the benefits of on-line interaction with a computer. The capacity of Johnniac, a Princeton-class computer constructed in 1950-1953, limits the service to small numerical computations.

Figure 1 demonstrates the production of a table followed by a short conversation directing JOSS to modify the program to specify Pythagorean triples. JOSS stores

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numerical values, forms, and steps that begin with numerical labels. The language permits the user to direct JOSS in editing as well as computing and typing.

Figure 2 is an example of the assistance JOSS gives by extensive checking of the user's instructions. The system has none of the problem-solving capacity required to carry on a sophisticated conversation. But by the appropriateness and timeliness of its comments from a stock of forty "canned" messages (mostly error messages), JOSS gives a true conversational flavor to any session. Frequently the user can repair an error on the spot and direct JOSS to continue. In this example, JOSS finally produced a table of natural logarithms by a Simpson's integration of 1/x without once having to restart.

During a recent week on a 10:00 a.m. to 6:00 p.m. schedule, 77 different users conducted 243 sessions with JOSS. They averaged two input lines and four output lines per minute per user. Few of these users had previous direct programming experience in any system.

Our conclusion is that, at least for small numerical problems, direct conversation with a computing system meets computing requirements that are not well-satisfied by conventional services.

```
1.1 Set c = sqrt(a*2 + b*2).
1.2 Type a,b,c in form 1.

Form 1:
a = __   b = __   c = __._______

2.1 Line.
2.2 Do part 1 for b = 1(1)a.

Do part 2 for a = 1(1)4.

a =  1   b =  1   c =  1.4142136

a =  2   b =  1   c =  2.2360680
a =  2   b =  2   c =  2.8284271

a =  3   b =  1   c =  3.1622777
a =  3   b =  2   c =  3.6055513
a =  3   b =  3   c =  4.2426407

a =  4   b =  1   c =  4.1231056
a =  4   b =  2   c =  4.4721360
a =  4   b =  3   c =  5.0000000
a =  4   b =  4   c =  5.6568543

Delete step 2.1.
1.2 Type a,b,c in form 1 if fp(c) = 0.
Type all steps.

1.1 Set c = sqrt(a*2 + b*2).
1.2 Type a,b,c in form 1 if fp(c) = 0.

2.2 Do part 1 for b = 1(1)a.

Do part 2 for a = 1(1)25.
a =  4   b =  3   c =  5.0000000
a =  8   b =  6   c = 10.0000000
a = 12   b =  5   c = 13.0000000
a = 12   b =  9   c = 15.0000000
a = 15   b =  8   c = 17.0000000
a = 16   b = 12   c = 20.0000000
a = 20   b = 15   c = 25.0000000
a = 21   b = 20   c = 29.0000000
a = 24   b =  7   c = 25.0000000
a = 24   b = 10   c = 26.0000000
a = 24   b = 18   c = 30.0000000

Delete all.
```

Figure 1

```
1.1 Set S = S + y·h/3.
1.2 Do part 2 for x = x+h.
1.3 Set S = S + 4·y·h/3.
1.4 Do part 2 for x = x+h.
1.5 Set S = S + y·h/3.
1.6 To step 1.1 if x<10.

2.1 Set y = 1/x.

1.55 Type x,S in form 1 if fp(x) = 0.
Type all steps.

1.1 Set S = S + y·h/3.
1.2 Do part 2 for x = x+h.
1.3 Set S = S + 4·y·h/3.
1.4 Do part 2 for x = x+h.
1.5 Set S = S + y·h/3.
1.55 Type x,S in form 1 if fp(x) = 0.
1.6 To step 1.1 if x<10.

2.1 Set y = 1/x.

Set S = 0.
Go.
Error above:  You haven't told me to do anything yet.
Do part 2 for x = 1.
Do part 1.
Error at step 1.1:  h is undefined.
Set h = .1.
Go.
Error at step 1.55:  I can't find the required form.
Form1:
Eh?
Form 1:
_.'-  '___
Go.
 2.0   .6932
Error at step 1.55:  I can't express value in your form.
Form 1:
_.'___'___
Go.
Error at step 1.55:  Your fields run together in the form.
Form 1:
_.'-  -.___
Go.
 3.0  1.0986
 4.0  1.3863
 5.0  1.6094
 6.0  1.7918
 7.0  1.9459
 8.0  2.0794
 9.0  2.1972
10.0  2.3026
```

Figure 2

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