Benchmarking Memory and Computational Efficiency of Various Languages

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Testing Methods

In order to test the time taken when running a program, I used the 'perf'
bash command, which can be used for a variety of performance testing
applications. This was used over the `time` command, which proved to be too
inaccurate for valuable results. In order to record the averages and control
the test sequences, I constructed the following short bash script:

```
#!/bin/bash
for i in {1..100}
do
   echo $(perf stat -r 1000 ./HelloWorld 2>&1 >/dev/null
   | tail -n 2 | sed 's/ \+//' | sed 's/ /,/'
   | sed 's/[^0-9.]//g')
done
```

This was run on each program, dependent on its specific running require-
ments (such as invoking Java or Lisp). The results were then sorted and
stored in a text file for later comparison. An example of the output can be
seen below (results are recorded in seconds) :

$$0.0007464720$$
$$0.0007465560$$
$$0.0007470370$$
$$0.0007487890$$
$$0.0007489340$$
$$\cdots$$

Results

Memory

Language	Space Occupied on Disk
Assembly	4 KB
C++	12 KB
COBOL	16 KB
Fortran	12 KB
Java	4 KB (JVM is approx. 150 MB)
Lisp	4 KB (clisp binary is 9.5 MB)

Computation Time

Language	Best Average Run Time	Overall Average Runtime
Assembly	0.1489200 ms	0.154975214 ms
C++	0.8101980 ms	0.841033607 ms
COBOL	0.7464720 ms	0.78310772 ms
Fortran	0.5536200 ms	0.588410766 ms
Java	48.8928690 ms	51.20942029 ms
Lisp	6.9800960 ms	7.34084656 ms

Conclusion

It is obvious that the Assembly implementation is the most efficient in both exececution time and binary size, which concurs with expectation. The compiled languages all complete within less than a millisecond, and the interpreted languages run dramatically slower (almost 50 times slower in Java's case). This is however only a limited test, and languages may be faster or slower than one another in certain environments and tasks.