19CSE100 – PROBLEM SOLVING AND ALGORITHMIC THINKING
PROGRAMMING LANGUAGE SURVEY ASSIGNMENT

HASKELL

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Haskell is a general-purpose, statically-typed, purely functional programming language with type inference and lazy evaluation.

ORIGIN

- During the late 1980s, a group of researchers started developing Haskell. It was finally published in 1990.
- It is named after a U.S. mathematician Haskell Brooks Curry, whose work in mathematical logic serves as a foundation for functional languages.
- Haskell is based on the lambda calculus, hence the lambda we use as a logo.

1987

FPCA’87 CONFERENCE

Haskell development committee was organized there.

1990

THE FIRST HASKELL REPORT

Document, which describes the motivation for creating the language, the nature of the language and the process of its creation, for which the committee is responsible.

1992

GLASGOW HASKELL COMPILER

The creation of GHC – open-source and the most commonly-used native code compiler for Haskell language.

1994

HASKELL.ORG

The main information page about Haskell basics was created.

1996

THE HASKELL VER. 1.3 REPORT

In terms of technical changes, it was the most significant release of Haskell after 1.0.

2005

HASKELL WORKSHOP

First ideas on how the new standard should be designed.

2010

THE HASKELL 2010 RELEASE

The most important point in the modern history of Haskell development and also it is the current standard for most Haskell developers.

PARADIGM

IT IS A PURELY FUNCTIONAL LANGUAGE, WHICH MEANS THAT FUNCTIONS GENERALLY HAVE NO SIDE EFFECTS. PURE FUNCTIONS ARE EASY TO COMPOSE, WHICH SUPPORTS BUILDING COMPLEX PROGRAMS FROM SIMPLE PARTS. THE FUNCTIONAL PARADIGM IS AN EXAMPLE OF DECLARATIVE PROGRAMMING. IT SEPARATES HASKELL FROM MOST OTHER PROGRAMMING LANGUAGES THAT FOLLOW THE IMPERATIVE PARADIGM, WHICH IS ALL ABOUT GIVING THE COMPUTER A SEQUENCE OF INSTRUCTIONS ON HOW TO SOLVE A PROBLEM.

Why use Haskell?

Writing large software systems that work is difficult and expensive. Maintaining those systems is even more difficult and expensive. Functional programming languages, such as Haskell, can make it easier and cheaper.

- Haskell is supported by operating systems like Windows, macOS, Linux etc.
- It is specifically designed to handle a wide range of applications, from numerical through to symbolic.
- Haskell has an expressive syntax, and a rich variety of built-in data types, including arbitrary-precision integers and rationals, as well as the more conventional integer, floating-point and boolean types.
- There are a number of compilers and interpreters available. All are free.

The Glasgow Haskell Compiler (GHC) is used for running the Haskell code. Its features are:

- It provides a cross-platform environment.
- It supports numerous extensions, libraries, and optimizations that help the process of generating and executing code.

Influence

- Haskell was influenced by many earlier programming languages like Clean, FP, Gofer, Hope and Hope+, Id, ISWIM, KRC, Lisp, Miranda, ML and Standard ML, Orwell, SASL, SISAL, and Scheme.
- It has heavily influenced design of newer languages such as Rust, as well as Agda, Bluespec, Cayenne, Clojure, CoffeeScript, Curry, Java/Generics, Mercury, Perl 6, Python, Scala, Visual Basic 9.0.

ADVANTAGES

Haskell offers you:

- Substantially increased programmer productivity.
- Shorter, clearer, and more maintainable code.
- Fewer errors, higher reliability.
- Higher compiling power.
- A smaller "semantic gap" between the programmer and the language.
- Shorter lead times.

Haskell is a wide-spectrum language, suitable for a variety of applications. It is particularly suitable for programs which need to be highly modifiable and maintainable.

Much of a software product's life is spent in specification, design and maintenance, and not in programming. Functional languages are superb for writing specifications which can actually be executed (and hence tested and debugged). Such a specification then is the first prototype of the final program.

Functional programs are also relatively easy to maintain, because the code is shorter, clearer, and the rigorous control of side effects eliminates a huge class of unforeseen interactions.

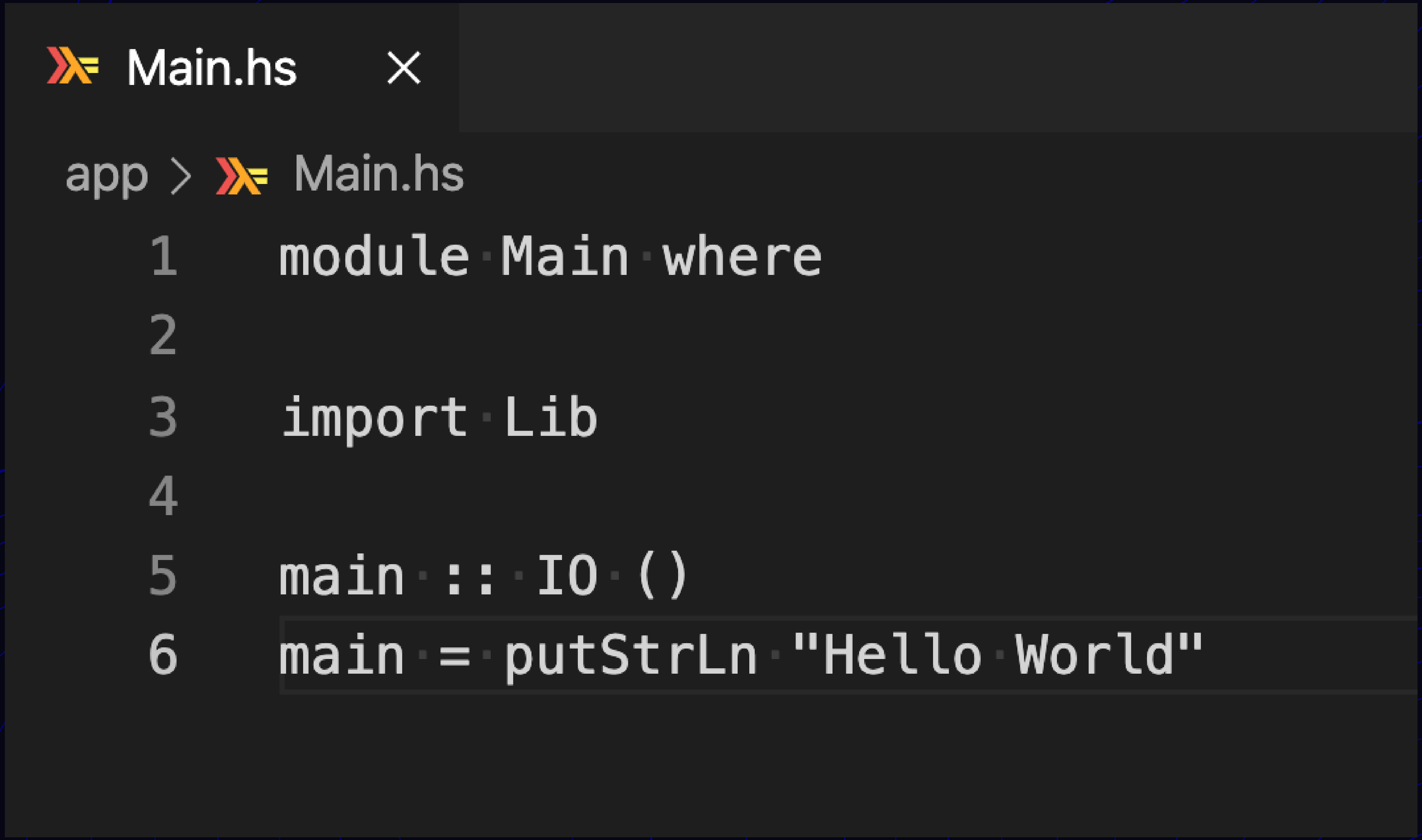
DISADVANTAGES

Some of its limitations are:

- Complicated interface
- Cryptic programs, which are sometimes complex to understand
- Not suitable to make time critical applications
- High learning time
- Lacks widespread implementation

It’s often said that simple things which matter in the real world are quite hard to write in Haskell. And indeed it requires more syntax to program in an imperative mutating style in Haskell when compared to Python or JavaScript.

Running Hello World



```haskell
module Main where

import Lib

main :: IO ()
main = putStrLn "Hello World"
```

Applications

Haskell has attracted a solid following in certain sub-fields of software development. Large companies like GitHub, Microsoft, Tesla, and Meta reach for the language when the necessity arises.

That's because Haskell is best-in-class for building two things: self-contained systems of any complexity and domain-specific languages (DSLs).

It is used in areas like finance, blockchain, education, the automotive industry, and developer tooling.

GITHUB

GitHub used Haskell for implementing Semantic, a command-line tool for parsing, analyzing, and comparing source code.

META

Meta is known to be a Haskell user and is also one of the biggest sponsors of the Haskell Foundation.

MICROSOFT

Microsoft uses Haskell in Bond, a cross-platform framework for working with schematized data.

STANDARD CHARTERED

Standard Chartered uses Haskell and Mu, a strict dialect of Haskell, to provide in-house technologies to traders and quantitative analysts.

TESLA

Tesla has been regularly hiring Haskell engineers and interns for some years. It uses Haskell to generate C code that is then compiled into vehicle firmware.

SEROKELL

Serokell uses Haskell to build the settlement layer of the Cardano blockchain, programming languages for the Tezos blockchain, cryptocurrency exchanges, a multi-currency wallet with its own DSL, and more.

THANK YOU !