A language and compiler for game structures

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Background

- A "game" is an activity involving some number of players and a way to "win"
  - Ex. sports, reality show games
- Infinitely many games are possible, but running most games would require a human "host", or someone with sufficient coding expertise to write their own code for a game to be played online
- An easy-to-understand DSL for describing game structures and generating programs to run the game could reduce the workload for human hosts and reduce the possibility of host biases affecting game results

Related Work

- Existing game DSLs are focused on video games or computer players ([1], for example)
- Brantsteele is a website for simulating games [2]
- Few playable game variations available on websites such as Tengaged [3] and Zwooper [4]
- Online Reality Games (ORG) designed and run by human hosts are often played on social media platforms (see [5])

Development Information

The Program

- 1500+ lines of Haskell code
- Target language is Python
  - Popular, succinct

Documentation

- All Haskell functions formally documented with Haddock

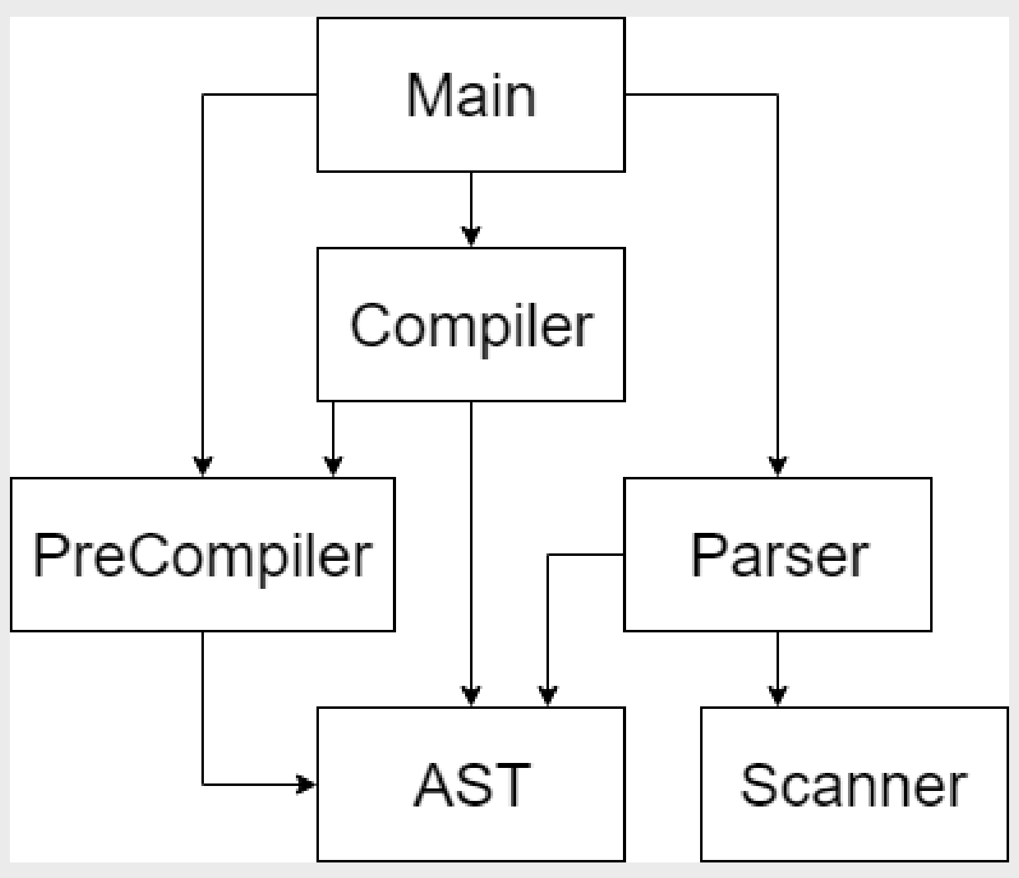
Tests

- Parser, PreCompiler, and Compiler are fully unit-tested using the HSpec framework in Haskell
- Over 320 test cases in total!
- 6 additional full example games act as integration tests
  - Tennis, baseball, Survivor, Big Brother, The Genius, and a completely original game

References

[1] Love, N., Hinrichs, T., Haley, D., Schkufza, E., Genesereth, M. (2008). General Game Playing: Game Description Language Specification. *Stanford Logic Group*.
[2] Brantsteele. `https://brantsteele.com`
[3] Tengaged. `https://tengaged.com`
[4] Zwooper. `https://zwooper.com`
[5] OnlineSurvivor. `https://www.reddit.com/r/OnlineSurvivor/`

Modules



Subset of the Grammar

Challenge: The language should be understandable for someone without coding experience, but sufficiently formal to be parsed

⟨*game*⟩ ::= 'Players:' <teamList> 'Rounds:' <roundList> 'Win:' <winCondition>

⟨*competition*⟩ ::= ['scored'] ['team'] 'competition between' <identifierList>

⟨*decision*⟩ ::= 'vote by' <identifierList> 'between' <identifierList> ['including self'] | ...

⟨*affiliationUpdate*⟩ ::= ('add' | 'remove') <name> | ...

⟨*counterUpdate*⟩ ::= 'set' <name> 'to' <value> | ...

Example - DSL to Python

Snippet of game description:

```
scored competition between everyone
```

Parser: Uses the Parsec library

```
competition = do {reserved "scored"
                 ; cmp <- competitor
                 ; reserved "competition"
                 ; reserved "between"
                 ; il <- identifierList
                 ; return $ Scored cmp il}
              <|> ...
```

AST node:

```
Scored Individual
    (IdList [IdVal Everyone (Num 1)] [])
```

Compiler:

```
compileComp (Scored Individual il) = do
    ildoc <- compileIdentifierList il 1
    return $ (vcat [fst ildoc,
    text "game.getScoredCompResults" <>
    parens (text "idList1")], snd ildoc)
```

Final Python code:

```
includeList1 = []; ident = game.playerList
idVal = ident; includeList1 += idVal
excludeList1 = []
idList1 = [x for x in includeList1
    if x not in excludeList1]
game.getScoredCompResults(idList1)
```

Conclusion and Future Work

- The domain of game structures can be captured by a DSL, including well-known and completely original game structures
- The generated code in its current form is not particularly useful, could be improved with a user interface, online-support, additional features such as game advantages, more conditional possibilities within rounds, variable names for phases, rounds, or tiebreakers, which would make the language more readable