Invitation to Ezhil: A Tamil Programming Language for Early Computer-Science Education

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Abstract:

Ezhil is a Tamil programming language with support for imperative programming, with mixed use of Tamil and English identifiers and function-names. Ezhil programing system is targeted toward the K-12 (junior high-school) level Tamil speaking students, as an early introduction to thinking like a computer-scientist. We believe this 'numeracy' knowledge is easily transferred over from a native language (Tamil) to the pervasive English language programming systems, in Java, dot-Net, Ruby or Python. Ezhil is an effort to improve access to computing in the 21st Century.

Introduction:

Ezhil has exclusively Tamil keywords, and provides built-in list, string, numeric data-types, mathematical and graphics functions, by building on the Python programming environment, as first reported in 2008 [1]. Recent Ezhil development, has added Turtle-graphics [2], See Fig. 4, Windows installation, and editor syntax-highlighting support, see Fig. 1, to enable a smooth development experience. Ezhil is the first freely available and completely open-source Tamil programming language with source downloads available via our website [3a,b]. This paper talks about the state of Ezhil-Language interpreter development as of current development release, v0.5 [3a].

In this paper we describe the installation and use of Ezhil language for curriculum development, graphics, and lesson-planning and showcase our system which is continually developed and expected to reach widespread deployment, trials in near future.
Language Overview:

Ezhil keywords

Ezhil Language has the following keywords, see [4], defining the control structures and imperative programming language constructs, which we explain with the grammar in the following sections.

1.- : "பிடிப்பி" மாந்திரம் (PRINT)
2.- : "தின்புரு" மாந்திரம் (BREAK)
3.- : "சிட்சு" மாந்திரம் (CONTINUE)
4.- : "பிரிமிக்கு" மாந்திரம் (RETURN)
5.- : "அடுத்தால", "டின்வாடுஏற்றால", "டின்வாடு" மாந்திரம் (IF-ELSEIF-ELSE)
6.- : "அடுத்து" மாந்திரம் (END)
7.- : "டின்வாடுஏற்று" மாந்திரம் (FUNCTION)
8.- : "அடுத்தம" மாந்திரம் (WHILE)

Data type system

The data type system supported by Ezhil currently includes four basic types, (floating point, integer) numbers, logical Boolean value types, string types, and lists. Lists (arrays) are a heterogeneous constructor. Dictionary (hashtable) support is planned for future.

Development Environment:

Ezhil programs can be run from the command-line mode in both Linux, and Windows. It can also be run from the web interface as we explain below.

Ezhil Interpreter in Command Line Mode

Ezhil Interpreter is invoked by the command ‘ez’. So when you type,"$ ez" on the command-line you will see, the following prompt,
and you can start entering your commands at this prompt and interactively use the interpreter.

You can try typing the following program line-by-line in the interpreter to see the output,

```
蚌shi "திருநல்நான் சொல்லாம் நன்றாக வந்து
蚌shi 10 + 15, 17/3.0, 17%3, 50 - 6*5, ( 50 - 5*6 )/4
printf("Hello \n World")
蚌shi "திருநல்நான் கைத்து வந்து
蚌shi 30 - 5, 5^2, 2^7
蚌shi "திருநல்நான் திருமுன் வந்து
蚌shi 5 * 5
蚌shi "திருநல்நான் திருமுன் வந்து
蚌shi 625 / 5
蚌shi "திருநல்நான் திருமுன் அழுது மீட்பு வந்து
蚌shi 25^2
蚌shi "சொல்லாம் புலியும் போக்கின் விளம்பு
蚌shi (((5 + (25^2))/6)^2)
蚌shi ( ( ( 5 ^ 2 ) + 5 ) / 6 ) ^ 2

# துணணி
蚌shi "நம்மகுழியின் குழாய்", 2*pi()*#
蚌shi "நம்மகுழி பாகி", pi()*#^2
# = 6 # மூத்தக்கணத்தின் பக்தம் உருவ
蚌shi "நம்பூதிரியா மூத்தக்கணத்தின் பாகி", 1/2*#^2*sin(pi()/3)
```

To use Ezhil interpreter in a batch mode fire it with a file names, “$ ./ez ./ezhil_tests/hello.n”

The help for the Ezhil interpreter can be obtained by,

```
$ ./ez --help
usage: ./ez [-h] [-debug] [-stdin] [files [files ...]]
```

positional arguments:
Typically user can write a Ezhil language program, a simple one for example, to get user input and print their age in this case,

```plaintext
# (C) மற்காலப் ஆண்டையும் 2013
# பிறம் முதல் பிறம் கண்டு கொண்டால் பிறம் குறவது
pid = பிறம் _ பிறம்("பிறம் பிறம் 'வதை ?' >> ")

expression = "பிறம்","பிறம்","பிறம்","வதை ?" >> 

age = பிறம் ("பிறம்+ பிறம் +", "பிறம் பிறம் வதை ? >> ")

@ (age >= 18 )
    பிற்பிள் "எண்பிக்கவும்! குறள் பாதுகாப்பு அதிகாரம்"

பிற்பிள் "பிறம் age கண்டுகொடு குறா சுத்தம்"

பிற்பிள் "பிறம் பாதுகாப்பு அதிகார செய்திகள் ",,(18-age)," அணுணம் குறா சுத்தம் !"

(பின்னர்
exit(0)
```

and save the file as ‘age.n’. All Ezhil programs should be encoded in UTF-8 without BOM, and you should be able to configure your text editor for this task To execute the program, type, “./ez age.n”

**Syntax Hiliting**

A good editor to program Ezhil language is more motivation for the user and catches some common mistakes like missing parentheses, brackets, matching keywords in a “begin-end” fashion.

All modern programming languages have syntax highlighting capability with popular editors. We try to provide the same for Ezhil language with three editors so far - emacs, Notepad++ on Windows, and gedit. In Fig. 1, Ezhil emacs mode, shows a guessing game program written in Ezhil language, and saved as “guess.n”.
The style files are found in the “Ezhil-Lang/ancilla” folder of our GitHub repository [3a], and need to be installed separately.

Fig. 1, Ezhil emacs mode, showing a guessing game written in Ezhil language

**Library Functions**

Currently Ezhil-Language supports over 350+ library functions, allowing you to do things like file I/O, turtle graphics, structured programming with user inputs, etc. We only see adding more library functions in the future based on Python.

**Language Support**

Ezhil Language will have support for additional constructs for iterators statements like, *for-each*, and *for* loops. A *switch-case* like construct is being thought about for relevance.

Arrays/lists are already supported for natural expressions, and you may define heterogeneous arrays and nested arrays. Array
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indexing with notation ‘[expr]’ and $lvalue, rvalue$ semantics is missing and will be added in future.

Ezhil Web Interface

Since Tamil input to the computer is still evolving with different Input-Methods (IME) and also to exploit the pervasiveness of the global web access, and remove barriers to trying out Ezhil, (i.e. without owning a computer, or Python/Ezhil installation etc.) we have decided on a web interface to Ezhil on the lines of tryruby.org or interactivepython [5a,b].

The web interface is not yet hosted on ezhillang.org our primary website. Launch the webserver on your local machine, by typing, $./webserver.sh$ from the Ezhil-Lang source directory. This should setup the server.

Now open the web browser, firefox, IE or google-chrome, and type, http://localhost:8080 in your address bar, which should open up a page, like in Fig. 2. The browser displays the Ezhil Language web interface client (to a server running on your local machine).

Now you may enter your programs in the editor at the center, and click execute to see the output, like in Fig. 3. Use Keywords helper for adding keywords in your program by a click. If you have a program that contains errors, it will show up in red text. You may navigate back from the results page (Fig. 3.) to source program page (Fig. 2) by clicking “Go Back” link.
Fig. 2. Ezhil Language Web Interface client to a server running on localhost. Enter your programs in the editor at the center, and click execute to see the output, like in Fig. 3. Use Keywords helper for adding keywords in your program by a click.
Your program executed correctly! Congratulations.

succeeded Execution for program

1. பிரித்த இணைக்கிறது வருகின்று கூடு கூட்டத்திற்கு சம ( P(0 / 2))
2. 
3. # 'உண்டு வருகிறது தகுதியும் பார்வைகளும் வடிவமாறு மற்றும்
4. # demo of a while loop
5. i = 10
6. பிரித்த 5/i
7. பிரித்த 5.0/i
8. பிரித்த i
9. இ(i > 6) அந்தத்
10. பிரித்த i
11. i = i - 1
12. பிரித்த
13. 14. பிரித்த "******** வருகிறது பார்வையும் வடிவமாறு பார்வையும் ********"
15. as

Fig. 3. Ezhil Language Web Interface server output from a program like in Fig. 2. Here the program has successfully executed, and the output is shown in green text. You can click the link “Go Back” to head back to the program evaluation screen, Fig. 2.
Curriculum Development:

Children learn from immediate, positive feedback, in a experiential manner. So we plan lessons in Ezhil around simple programs, and interactive experiences with user input, graphics, sounds and terminal/console output.

A simple program to print a square in Ezil graphics will be, for the first attempt, straight-line code, which they can understand the meaning of the constructs, and have fun executing to see a output from their command.

```ezil
# புதிய படம் பன்னாட்டு செதுக்க வகை
(90)
(90)
(90)
(90)
(90)
(90)
(90)
(90)
(90)
(90)
```

Next lesson would be to improve the program to eliminate repetition – i.e. provide automation using a while loop – which is a key lesson here – and they will write the following program,

```ezil
# அளவிலை இருபத்து குறிப்பி கலவை படம்பாட்டியின் உண்டாகவும்
# விளக்கத்திற்கு என்று பாதிப்பு வசதிக்கவும் படம்பாட்டின்
k = 0

@ ( k < 4 ) பண்டை
  (90)
  (90)
  k = k + 1
```

Ezhil language for curriculum development is being seriously thought about and our exercises so far, include

1. hello word program,
2. iteration tests,
3. printing multiplication tables,
4. developing a quiz
5. drawing squares with turtle graphics
6. complex symbols with turtle graphics
7. Calculation/graphics based on recursion

We have incorporated these ideas into an upcoming book [6], to be available at a widely accessible cost.

A slightly advanced program to draw, Yin-Yang, Chinese symbols, as interlocking circles with color filling is shown in Fig. 4. See our source code examples for details “ezhil_tests/yinyang.n” [3a]

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Fig. 4. Ezhil mode Turtle-graphics to draw Yin-Yang Chinese energy symbols.

**Conclusions:**

Ezhil is a Tamil programming language, developed in 2007-08, and dormant for a few years, and it has been recently revived. We believe this ‘numeracy’ knowledge is easily transferred over from a native language (Tamil) to the pervasive English language programming systems, in Java, dot-Net, Ruby or Python.

Ezhil is a promising effort to improve access to computing in the 21st Century through ‘numeracy’ education, by being free and open-source, easily accessibly on multiple platforms, and being well documented.
References:

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2. Python 2.7 docs, “turtle - Turtle graphics for Tk”, http://docs.python.org/2/library/turtle.html

3a. Ezhil-Lang download page on Git-Hub: https://github.com/arcturusannamalai/Ezhil-Lang/archive/master.zip,

3b. Ezhil-Lang project homepage: http://ezhillang.org

4. Ezhil on Wikipedia : (Tamil) - http://ta.wikipedia.org/wiki/எழில்_(சிற்றக்கிளச்_மொழியில்), (English) - http://en.wikipedia.org/wiki/Ezhil_(programming_language)

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