Structured Language:

Variable names cannot consist of the following:

1. Numbers (e.g. one, 2, ten) [Consider using: First, second, third instead]
2. Boolean (e.g. true, false)
3. Variable types (e.g. String, character, integer)
4. Comparison operators (e.g. less than, greater than, less than equal, not equal)
5. Logical operators (e.g. and, or)
6. Unary operators (“minus minus”, “plus plus”, “not”, “negative”)
7. Following keywords: “declare”, “array”, “size”, “with”, “equal”, “equals”, “index”, “if”, “then”, “else”, “end”, “create”, “function”, “return”, “type”, “parameter”, “call”, “for”, “while”, “switch”, “case”, “then”, “dot”

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| Programming Constructs | Proposed Structured Language | Example speech | Example code |
| Verbalizing words of different forms | Integer: just verbalize the number | Ten  One three four | 10  134 |
| Float: verbalize the number and use point for the decimal place | Three four point two  (Can consider accepting spoken number, e.g. thirty-four) | 34.2 |
| String: String (string content) | x equal string nine  x equal string true | x = “nine”  x = “true” |
| Character: character (character content) | x equal character x | X = ‘x’ |
| Boolean: verbalize true or false  [only for languages with Boolean] | is done equal true | isDone = true |
| if-else conditions | if – then - else if – then – else - end if  (When dealing with nested if-loops, use end if to close the if loop) | if A then B if C then D else if E then F end if G end if | if (A) {  B  if (C) {  D  } else if (E) {  F  }  G  } |
| Variable declaration | declare (variable type) (variable name)  [Optional: equal (literal)] | declare integer x | int x |
| declare float tax rate equal one point zero seven | float taxRate = 1.07 |
| Array declaration | declare (variable type) array (variable name) size (number)  [Optional: with] | declare integer array sequence size ten  declare integer array sequence with size ten | int sequence[10] |
| Variable assignment | (variable name) equal (literal)  [can use equals instead of equal]  [Note: we do not allow equal to as to can be commonly misread as 2] | x equal ten  x equals ten | x = 10 |
| Array assignment | (variable name) array index (index) equal (literal) | sequence array index three equal four | sequence[3] = 4 |
| Function declaration | create function (function name) return type (variable type) parameter (variable type) (variable name) – end function  [Optional: with] | create function search return type boolean parameter integer lower parameter integer higher A end function  create function search with return type Boolean with parameter integer lower with parameter integer higher A end function | bool search(int lower, int higher) {  A  } |
| Function call | call function (function name) parameter (variable name)  [Optional: with]  call (function name) function parameter (variable name) | call function search parameter lower parameter higher  call function search with parameter lower with parameter higher  call search function with parameter lower with parameter higher | search(lower, higher) |
| For loops | for (variable type) (variable name) equal (literal)  (variable name) (comparison operator) (literal) (variable name) (operator) then – end for | for integer i equal one i less than sum i plus plus then end for | for (int i=1; i<sum; i++) {  } |
| switch - case | switch (variable name) case (literal) – end switch | switch alphabet case character a X case character b Y end switch | switch(alphabet) {  case a:  X  case b:  Y  } |
| While loops | While (variable name/ true / false) then – end while | while true then A end while  while A then B end while | while(true) {  A  }  while (A) {  B  } |
| Dot operator | dot | human dot call function eat  human dot height | human.eat()  human.height |

Basket of words for testing:

Google Cloud gets better results when preferred\_phrases contain the whole phrase

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| --- | --- | --- | --- |
| Words | Google Results | Google Cloud Results | Microsoft Bing Results |
| Equal | Correct | Correct | Correct |
| If then else | Correct though not 100% | Correct though not 100% | A lot of misreading (best case : “then else”) |
| End if | Correct though not 100% | Correct | A lot of misreading (best case : “end is”) |
| Declare integer | Correct though not 100% | Correct though not 100% | Correct though not 100% |
| Size | Correct | Correct | Correct |
| Index | Correct | Correct | Correct |
| Create function | Correct though not 100% | Correct | Correct |
| Return type | Correct | Correct | Correct |
| Parameter | Correct | Correct | A lot of misreading (best case : “Perimetre” and “para meter”) |
| Call | Correct | Correct | Correct |
| For | Misread as “fall” and “4” | Correct though not 100% | Misread as “fall” and “4” |
| Plus plus | Correct though not 100% (commonly read as “place place”) | Correct though not 100% (perform better than google results) | Correct |
| while | Could not recognize (commonly read as “wild”, “wall”, “Wall-E”) | Could not recognize (commonly read as “wild”, “wall”, “Wall-E”) | Could not recognize (commonly read as “wow”) |
| Switch case end switch | Correct though not 100% and “end” commonly spelled as "and" | Correct though not 100% | Correct though not 100% (“switch” misspelled as “which” sometimes , “end” misread as “and” ) |
| Dot | Read as ‘.’ | Correct | Correct though not 100% (commonly read as “don’t) |

Main problems:

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| Problem | Explanation | Example(s) |
| Homophones | Words that sound similar but have different spelling and meaning | “four” vs “for”  “and” vs “n” |
| Noise or stop words | Words with no meaning | “erm”, “uh” |
| Capitalization | Which alphabet to apply capitalization on | “printStackTrace” vs “PrintStackTrace” |
| Spaces | Whether space is required between words | “Device waterMeter” vs  “deviceWaterMeter” |
| Punctuations | Dot operator, braces, semicolon | “.” , “{” , “}” , “;” |

Sample Program:

pip install SpeechRecognition  
pip install pyaudio

pip install pocketsphinx # only if using recognize\_sphinx  
// python -m speech\_recognition

Problems:

Background noise (especially if great variance)

Homophones

Record:

Week 2: Sample program from speech to text using Google Speech Recognition API with SpeechRecognition python library + structured language defining

Week 3: Sample program using Google Cloud Speech Recognition API with preferred phrases and Microsoft Bing API