

Arabic Programming Language Evolution—A Survey

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Abstract- The existing system and most of the new technologies are developed with codes written in the structured English format. As a result, programmers, especially the Arabic ones, learn the English language and use its syntax in code instructions, which may limit their programming abilities. Moreover, if the beginner Arabic programmers want to be professional in programming, they have to be professional in the English language too. Therefore, the purpose of this paper is to describe the abilities to use Arabic language in developing the instructions of the programming language by reviewing the facile programming language, as well as knowing historical start of using the English language as a programming language. Furthermore, knowing the development of their technologies will emphasize the methods of the translated English instructions into applicable computer instructions by knowing the infrastructure of the compiler mission in order to understand the existed previous work.

Index Terms- Translate English language, Computer Language, Native Speakers, Facile programming.

1 INTRODUCTION

Technology is developed to facilitate people lives. Programming languages are the main means to implement the technology and to make it flexible as possible. People need to learn a new language, especially when they live abroad, to communicate with other easily rather than having translators. Other people, who are not living abroad, need to learn foreign languages because of their study needs or if they are programmers, for special instance the English language. However, if the programmer has not the needed abilities to learn English, or they doesn't like it, their programming skills are going to be worse. This scenario explains the difficulties when a non-native speaker is using any other language to program with rather than mother tongue.

Arabic professional programmers translate the guides of developing computer applications with different technologies to help the Arabic beginners to learn how to use the algebra operations [1] and the algorithms [2] to develop the needed applications in their communities. According to Alazhari [3], described the history of programming which forced the programmers in the early decades to deal with computers in the machine language (0s and 1s) which was so hard to program because it is the most low-level language and require a huge experience in machine language and hardware control. Although its instructions need no compilation or interpretation to perform any task, it is different from set to set according to the different hardware used [4]. The programmer had to learn more than one machine language because of machine language were different from one machine to another machine. They used translators, but it didn't work because of the multiple natural languages. So, they created assembly language which uses the English language statements, and the assemblers translate assembly language programs to machine language programs using lookup tables. Assembly language is also a low-level language which was also complex to program, so high-level programming languages were invented [4]. However, and to the best of our knowledge, their all syntax or instructions are depending on the English language syntax. In this way, the English language affects the programming ability of the programmers [5] and it is difficult for people to program by using others' language such as the English [6]. In addition, having a programming language using the Arabic language which seems like C language, according to Alazhary [3], the non-English based programming languages have not become popular, and have not been taught at universities as a key course [3] because the university is going with the programming language that is needed in the business market. Consequently, we will look for answers to the following questions:

We need to know how the English language is supported in the programming languages. Is it possible to use the Arabic language instead of using English language to write a computer program or execute instruction in the computer machine, the reason of not using Arabic language in programming is because of physical, such as (hardware) or is it because of a logical reason, such as (software, and Standard).

To explain the answers we got for these questions, we are going to do a survey in order to find attempts and to know the reasons and consequences of the problem and to investigate if there will be a programming language that can be supported by the Arabic language in the future. Three things have to be considered by Pitz [7] when designing a programming language: Fast speed, enough space for programs, Easy to learn (at least easier than assembly language). Learn PDP-8, and LINC, and Necessary to use LAP-6-DIAL for writing source program and filing completely programs [7].

Finally, there are people who cannot learn English, and they wish if they could deal with machine using their own language. So, the best way is to enable programming language according to their language understanding, concepts, functional, syntax, and logic, and matching their way of speaking, and reading.

The rest of the paper is organized as follows: the human and machine will be discussed in the next section, the computer technologies and hardware will be discussed in section 3. The programming languages and software will be discussed in section 4. In Section 5 is the comparison of the literature. Conclude the work will be in section 6.

2 HUMAN AND MACHINE

Calculations were the foundation of computers, Algebra is the science of Mathematics found by Muslims scientist, such as Jabir ibn Hayyan, and Mohammed ben Musa Al-Khwarizmi [8]. The English language translates instructions that are written by the programmer into machine language. The computer will perform a certain task by compiling the instructions and translate the instructions into machine language (Binary codes 0, and 1).

There is a mystery in computer history [9] because computers first to be known were in the war. The first electronic programmable computer was built by Tommy Flowers[9]. The history of programming, and compiling started by Ada Byron also known as "Lady Lovelace", Ada was the first programmer she translated the notes of Luigi Menabrea who published in Italy the notes of the Lucasian Charles Babbage a Mathematics Professor in 1827-1839 at Cambridge University, and who taught Ada by himself [10]. Britain professor gave the idea of electronic computer started by using vole, and that helps because the computer is a collection of switches [9]. Ada became known for her work , and ideas around the concept of the mechanical computer that made her the first computer programmer [11].

According to Barry Cooper [13], German was also using a machine called, Enigma machine known in 1940, which was used in the second war to encrypt and decrypt the German military messages. Furthermore the Enigma has many processes such as scanning, replaces the characters with defined characters, then use simultaneous scanning, inverses itself by the Diagonal Board, and another process [13]. Turing et.al [1] described the way of the problem faced, and the solution was by the computer which made a solution of programming language. The process was by using algebra operations and translated them to computer machine [1]. According to Fredrik et.al, and et.al [14] there is liner Algebra libraries that support matrix operations such as the early library McNamee, also MATLAB system that supports Algebra operations [14]. Dell developed HECL for a 4k machine in 1972. SP specific purpose system PDP-8 described by Schneider, and Scholz in 1973 [7].

2.1 Compilation

The Translator will translate the assembly language into machine language (binary codes (zeros, and ones)). The Structure of a Compiler, A compiler performs two major tasks: Analysis of the source program being compiled (Recognition of syntactic structure), and synthesis of a target program (Semantic analysis examines the meaning (semantics) of the program) [15].

Fredrik. K et.al [14] described a solution for a compiler, and by using the liner Algebra compiler which supports libraries for the computation. The prototype compiler is created by liner Algebra compiler to use Algebra expiration in the loop to solve the problem of computing expressions which are written in a kernel such as a mix of sparse, and dense tensors, matrices [14]. Increase simulator performance by the approach, called fast-forwarding, Facile is a language for describing instruction encodings, micro-architectural details, and semantics instruction on the Facile compiler for translating a processor description into an efficient simulator. The compiler uses partial evaluation analyses to translate a simulator written in Facile will improve performance by using the developed fast-forwarding approach(use the queue, which lists the Instructions will be that used) [16].

Mihai et.al [17] described using Symbols in the compiler to make the operation of the compiler, such as Tensor \otimes , Star $*$, Conditional COND, CASES, Function PCFunc, and Iteration DO [17].

The machine deal with many programming levels to be executed to perform the task. Firstly, the High-level language C (needs interpreter e.g. (FOCAL)), then in very low level language in the machines the Assembly language is represented, which is an (English language instructions), assembler, interpreter (translator). Finally, the Binary codes (0, 1) are the place in the machine that the instructions are executed, which is known as the Machine language [7].

3 COMPUTING TECHNOLOGIES AND SOFTWARES

The ways of a modern computer (microcomputer (microprocessor), new technologies (Android smartphone cell phones)) are having the same computing concept.

3.1 Microprocessor chips

The microprocessor is a computer processor in one chip which includes an arithmetic unit and control circuits. The Microcomputer is a microprocessor with memory, and input/output units. The system includes a microprocessor chip with memory chips (ROM read-only memory, and random access memory RAM), and I/O units give much greater flexibility than hardwired systems in many applications [2]. ROM can be programmed to define a logic that has previously been possible only in hardware. RAM is to store data permanently [2].

The first Microprocessor 4004 was designed to desktop calculator by Intel in 1971 consist of, 8 μ m pMOS, 2,300 transistors, 4-bit accumulator architecture, 3x4mm², 8-16 cycles/inst, and it has 750kHz for embedded clock [10].

According to Slatter [18], described a Microprocessor in 1996, and he said before 25 years the microprocessor was used in many chips from Telephone to Supercomputer, and in 1996 microprocessor was used in personal computers [18]. IBM bought QDOS from Seattle Computer Product [10]. The x86 used complicated instructions. The CISC architecture reduced the instructions such as integrated a few functions other than cache memory or using RISC architecture such as PA-RISC, Mips, Sparc, Alpha, and power pc and integrated bus interfaces. Digital Signal Processors (DSPs) is a real-time processing of digitized analog signal [18]. Then 8-bit micros used in hobbyist personal computers, such as Micral, Altair, TRS-80, Apple-II [10].

Cellphones provided with two chips, each with an ARM general-purpose processor (GPP), and a DSP (TI OMAP 2420). It is important to concern about the watts of the electronics because some electronic devices not to use more than 3 watts [10]. According to C. G. Bell et.al [19], the first Minicomputer began with EDSAC at first operating stored program computer which built in the early 50s to do the scientific calculation. it was famous because it was cheap, also in the 60s the Aerospace claim to be the antecedents [19]. In addition, the Multicores are used in a supercomputer [10].

According to Daniel [20], there are clarifications of Microprocessors, 1-General Purpose Processors (GPP) purpose applications Microcontrollers: 1.1 -GPP proper: general Microprocessors, The ASP Application Specific Processors [20]. 2- Application Specific Processors, DSP (Digital Signal Processor): programmable microprocessor for extensive numerical real-time computations. ASIC (Application Specific Integrated Circuit): algorithm completely implemented in hardware. ASIP (Application Specific Instruction Set Processor): programmable microprocessor where hardware, and instruction set are designed together Specialization for one special application [20].

The developing size of computer machine was by its mechanism (The switches), first was the mechanical switches, voles, the transistors, in 1998 the switch environment called a Silicone chip (CPU) [9].

Yui-May et.al [2] described the power saving in machines by using a microprocessor. The algorithms are used in 1980 to create a machine used in its function, and architecture [2].

Eric C. Schnarr et.al [16] described problem processor architecture, and simulation, and solution to make a simulation for processor architecture, and by using Facile, and its compiler will make the computer architects be accessible [16].

The instructions can deal with the registers by interpreters, such as C procedural language. CPU registers used by the add instruction might be dynamically renamed, and dynamically scheduled on one of several ALU (Algorithm Logical Unit), the huge instructions will slow down the processor [8], examples: Addr (0x10074), Instruction (CLR %fp), Stage (done), Latency (0), Addr (0x10078), Instruction (LD [%sp + 0x40], %l0), Stage (cache), Latency (6), Addr (0x1007c), Instruction (add %sp, 0x44, %l1), Stage (exec), Latency (1) [16].

The microprocessor makes a special performance by its special architecture, and its function, for instance, a new class of (DSPs) called a media processor, to handle a process such as a video, audio, and others multimedia [18].

David et.al [21] described the way of cheese work, then analyzed this process, and converts them into algebra operations, then into machine language 0, 1, and uses the automation to let programmer play with the computer, and that solve the problems of the cheese play.

4 PROGRAMMING LANGUAGES

Mohamed O [22] developed a compiler, and an Arabic programming language called DHAD, programming language to help the students to learn a C, and Assembly programming languages, the idea is by enabling the student to write a program using Arabic keywords, and it will be translated by C language into Assembly language. The language has its own editor, and compiler it is like framework, it is using the translation of Arabic into C, and into Assembly. The environment enables the user to view the codes in C, and Assembly [22]. DHAD is provided with the Help choice, which provides tools, examples, and instructions of using the language in Arabic language words. The program has an extension Arabic Programming Language (APL), also it is provided with many forms of keywords with the keyword like high-level programming languages grammars, such as (C, C++, and Pascal). The parser is built based on the grammar of the language to help in the syntax [22]. The programming language provided with many keywords to give the ability to use their own format, and have the ability to change any keyword in the DHAD program [22].

Ashok V. et.al [5] surveyed whether a native English could be a good programmer, by making an experiment on someone who is professional in English, and someone is not professional, found that the English professional has the ability of programming skills [5]. Most of the programming language is written in the English language such as, C#, C++, and Java, which has English keywords, and grammatical rules (syntax), which enable the native speaker to develop a useful, and perfect program, system,

website, application, such as Facebook, BBC news use MySQL [5]. The English language is difficult for the programmer to understand the error message of the compiler, or not understand the syntax of the language, or not able to write command. The result of teaching the English will improve the quality of learning programming understanding the function of programming will help in improving their programming techniques [5].

Ashok K. V. et.al [5] described the effects of the programming ability from the programming languages because of the use of the English language, so, students are not very good in English language are dealing with computer by using the English language as instructions to computer machine, which limit the students communication with computer, and limits the students development of programming [5].

According to Elazhary, [3] Facile programming means developing a new version of a programming language based on the students' language for the students who are not very good in the English language [3].

Elazhary justified that will help students to write a code based on the student understanding of the code to satisfy their wants, and their needs [3].

Mrwan B. I. et.al [23] described the students lack in English us weaken their programming language skills and communications with computers, and the result is to make test students with Arabic programming language and make TOFEL, or LTS tests, to confirm the weaknesses, and reasons, and try to solve the problem.

P. J. Landin [24] the ALGOL 90 distinguished between the publication language, reference language (reports), and hardware language (are the translation of reference language). Focus on a syntax, and semantic is important [24].

Youssef A. et. al [25], explained the Natural language helps people to extract their programming ideas by developing MyProLang, programming language using GUI and using natural language, design of the language, like include-directives, compiler primitives, classes declaration, functions must be handed, programming language characterized by its syntax simplicity, and expressiveness, by automatic programming, and facility for rapid application development (RAD), it was implemented by visual studio MS C#.NET 2005 with 20,000 line code [10]. GUI Template-driven source-code generators are a type of code which generate automatic make ready program. National language helped in dealing with the interface by the simple language. The generation language will be like C++. This will increase productivity, quality, and time-to-market in software development [25].

Alexandre E [6] developed a compiler for programming the SPE in the program dedicate the sector by the assembler, choose the SIMD instructions, and schedule the codes [6].

The Mihai Budiu et.al [17] described a structure of the compiler, types of compilers, the codes on the compiler are using somehow English letters, and mathematical operations, it has 3 processes translate from cluster-level into machine level, then from machine level into a set of computations in CPU core-level, and then implementation in the core-level computation [17]. The paper discussed a way to use multiple cores on each machine. It used many compiling according to their needs to improve the performance, and the time, for example, in some process it used the Compiling Matrix Algebra because it is translated by seconds [17].

Diego et.al [26] described a linear algebra compiler by using it to obtain a high performance. The compiler is written in Mathematica to perform a high-performance algorithm by automatically exploits domain knowledge. According to the processor is supporting the assembly instructions directly [26].

Hanan [3] developed The Arabic version of SQL, which is like programming language implemented in a program like a compiler. Actually, translated SQL queries from Arabic into English need the Arabic SQL lexical and parser, the lexical analyzer (to detect errors and spelling mistakes) and parser (detect any syntax errors) [3].

Hanan [3] developed translators that can translate program Syntax errors in the Arabic versions can be detected and the corresponding error messages. The goal is to enable the programmer to have programming abilities [3]. The problem is English is difficult for some students, the solution is to make a program let the student use common language to improve students programming capabilities. Solution by developed an Arabic translated version of LISP and SQL [3]

Gordon F. Pitz [7] described an SP-12 language and PDP-12 computer specific purpose is assembly language contracted from (depend on, can be built on) machine language called by the interpreter. Symbolic (assembly) language is easy to learn (assembler) symbolic translate the source program into binary code [7].

Using assembler will increase the interpreter speed. FOCAL is a higher level interpreter and this is an 8-bit machine which needs a lower level interpreter to increase the performance [7].

Benjamin M. et.al [27] explained the problem of using voice recognition in instructions to control the device. Some people miss world pronunciation accuracy. Solution by system recognize a voice and make it accurately even with the different pronunciations to make commands [27].

5 COMPARISON OF THE LITERATURE

Arabian students and non-native speakers face programming difficulties, which limit their programming capabilities and understanding using the English language, two solutions are surveyed, the first solution could be done by developing Arabic programming language [5, 24, 25]. Another solution is by making students be a professional in the English language [5, 23]. The other details are described above.

There are people who are with building a new language and there are people who are against any other programming language rather than using English.

Gordon F. Pitz [7] is with the idea of a new programming language could solve previous problems. On the other hand, there are people against the idea of building programming language on-line computers Pilla (1973).

Author	Problem	State of the art
Eric C. Schnarr et.al [16]	Problem processor architecture and Solution to make simulation for simulation	processor architecture [16]
Hanan Elazhary[3]	programming language are difficult for nonnative students Students facing difficulties in dealing with the Databases. Arabian Students facing a programming difficulties.	Justified that, will help students to write a code based on the student understanding of the code to satisfy their wants and their needs. Developed compiler and translate queries language into Arabic language to enable student use a program in way that is using Arabic version of SQL. Developed an Arabic version of LISP with the programming Environment.
Mrwan B. I. et.al [23]	lack in English us Student should get the TOFEL weaken their programming language skills	LTS tests to be a professional in English

P. J. Landin [24]	described a non-English codes	the ALGOL 90 is Russian programming language
Youssef A. et.al [25]	Arabian face difficulties Developed GUI interface to make in programming in English, which affects the productivity, quality and time-to-market in software development.	A program provides. Arabic National language helped in dealing with the interface by the simple language. The generation language will be like C++ without the need of using English programming codes. Developed MyProLang programming language using natural language and support GUI (Graphical User Interface) without the need of use coding [25].
Alexandre E. et.al [6]	Optimizing Compiler for a CELL Processor	The compiler could be used games and multimedia by using a programmable processor use assembler [6].
Mihai B[17]	Performance in processor	using algorithm and developed a Compiler
Diego et.al [26]	Need to improve the performance	The goal is to support the kernel with high performance by using the available recourse of Algebra library The developed compiler based on Algebra will make the performance better

Gordon F. Pitz [7]	The slow in compilation	Described a SP-12 language and PDP-12 computer. Using assembler will increase the interpreter speed.
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Being a professional in English will make consequences of side effects, such as it cost time, money, will limit the successful programmers and limit the developing of technology. Furthermore, it is not the right solution because Arabian thoughts, ideas, wants, needs, concepts, syntax, and understanding are not matching the structure of English programming language, moreover what about the students who could not learn the English language.

The Arabian programmer face programming difficulties such as programmer learn the foreign language since it is not their mother language, so if the programmer had difficulties in learning English language will effect their programming performance.

Secondly, the native English programmer deal with the english codes in an easy way which makes the high level language very useful to the native English program and this is the reason why such high level language are developed. On the other hand Arabin programmers deal with high level language in way that doesn't make sense to the Arabian programmers. The Arabian programmers deal with the high level language in difficult way like the native English programmer deal with the machine language.

Moreover, translating the English language into Arabic language would change the meaning into a totally different meaning, such as key words like while, for, and others their English meaning are interfered with Arabic meaning, which deal with the the codes in difficult way. Even though it could be possible to get translation with high quality by using the MT, but the more accurate translation results could be given by MT, the more machine capabilites and huge codes that would be provided. In addition, the use if MT in translation is still performed using non-native codes [28] .

In addition, learning language such as English costs time as well as money which also effects the programmers production. For example, they need extra time to develop system, while the native English programmer could build a system in short time, and that explain the reason of technology development in Arabian countries.

Since the technologies are used in wars, the beginning of the programming languages are somehow mysteries. For example, technologies are used in the second word war, which could be highly classified information. In addition, most of the standirization organizations are exist in places the people are native English speakers, and there is no Arabic standirization organization.

In summary, since the English language are supported in many technologies as well as provided many businesses opportunities, there would be many risks needed to be taken when implementing the Arabic programming language.

6 CONCLUSION AND FUTURE WORK

In conclusion, technology is developed to help people. The programming language is designed to help people dealing with the machine and developing the technologies. The compiler is used when the programmer wrote a program in the High-Level language (understandable English language such as C, C++, and others). The compiler translates the instructions into the assembly language (which uses English language commands and symbols). The translator translates the assembly language into machine language. The machine language uses binary codes (zeros and ones) to perform the task.

In this paper, different pieces of research, that are discussing the usage of the Arabic language in the programming languages, are surveyed. Since the computers were used in wars, the computers history is somehow mysterious. The history of the programming language is known from English countries. The first programmer was a British woman which entered the English language in programming. Algebra operation and algorithms were the started points of developing machines. Most of the programming language support English codes. The instruction used in microprocessors and compiler based on the use of Algorithms, and Algebra operations.

After this research is done. The research provided many ideas, such as it is difficult to follow the history of programming language ended with mysterious and very short explanation about the computer as well as the technology histories. Since there is no factories build technologies in the Arabian world, it is difficult to find technologies such as Macros, CPUs, or other technologies that support Arabian programmers to program in Arabic language because any programming language needed to

be in technology that supports that language, and that was the reason for Arabic Programming Languages to be translated from English language, which made the programming perception difficult for Arabian programmers because some keywords will be in totally different meaning as well as the presents of the difficulties programming concepts. Finally, since most of the technologies are provided with programming language that supports English language, it is difficult for most of the Arabian programmers to learn programming language that doesn't make profite. Sooner or later Arabic programming language is needed to be created.

Future research must be continued to determine the solutions for the Arabic programmers and find a programming language that does not follow the translation from English programming language, which would be proper to the Arabic programmer's concepts and thoughts.

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