**Free Assembly Languages for developing real-time operating system for embedded devices**

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**Abstract:** Usage of assembly languages is most natural way to program embedded devices. There are several types of instruction-set architectures. x86, RISC, CISC and RISC-V instruction-set architectures are the most known. There are different free assembly languages for different devices. For x86 based devices Netwide assembler or Yarn assembler can be used. For devices based on RISC based devices there are GNU assembler, AVR assembler. For RISC-V based devices can be used RISC-V assembler. This paper describes process of finding best assembler to design real-time operating system.

**Keywords: risc-v assembly, avr assembly, operating system**

1. **Introduction**

Programming languages for operating system design are C and Assemly language. There are several types of operating systems:for general-purpose use such as macOS. GNU/Linux distributions can be use both for general-purpose and for real-time. AVR assembler is used for range of AVR RISC devices. Binutils package contains linker *ld* and *GNU assembler*. GNU assembler can be used for RISC-based single board computers, such as Raspberry Pi 3, 4 or for latest Raspberry Pi 5.

**2. Material and Methods**

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| **Operating System** | **Type** | **Written in** |
| Zephyr | real-time | C |
| FreeRTOS | real-time | C |

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1. PhD Theme: Methods and Tools to develop a assembly-based operating system for embedded devices [↑](#footnote-ref-2)