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A design for processors using lasers to process data

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ABSTRACT
Laser employing microprocessors can significantly increase clock speed, as it would operate with lasers working in successive patterns of on and off, unlike current processors, which use electricity to transmit pulses of data, and light travels from one place to another in the smallest time physically possible. It also increases the clock speed by using a different encoding algorithm from current microprocessors.

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I. INTRODUCTION

The first commercially available microprocessor was the Intel 4004, a 4-bit central processing unit (CPU), released by Intel Corporation in 1971[1]. Almost all microprocessors today work in binary i.e. zeroes and ones, sometimes called “low” or “high” respectively. Binary files are also identified as executable programs because the processor can directly execute them to return an output or store data in primary or secondary storage. Current microprocessors work based on transistors, circuits, logic gates, logic blocks, software and a few other components depending on the particular device. They are divided into two components – the Arithmetic Unit, which performs arithmetic calculations, and the Control Unit, which runs the fetch-execute cycle.[1]

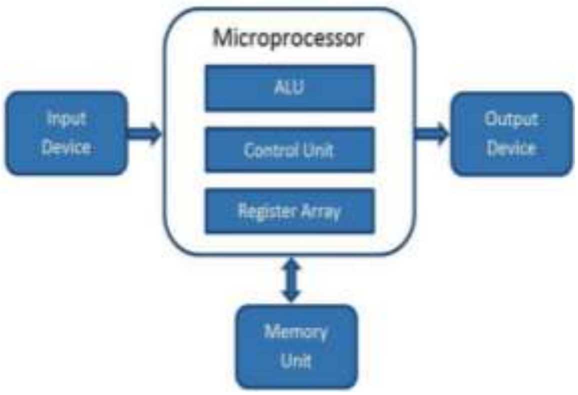

Fig1: Schematic diagram of the microprocessor

Until now, these processors have been using electricity as a means to transport data to different memory locations. A different approach to microprocessors I propose is that they use the technology of lasers, and the characteristics of its wavelengths and frequencies, combined with manually firing lasers in rapid succession deliberately to interpret and process data.[2]

II. DESIGN

The purpose of this paper is to bring to light the workings and advantages of using a laser-powered microprocessor over traditional circuit microprocessors. It is important that we use the most efficient and straightforward way to communicate data, which is practically information and knowledge, which govern the entire understanding of the universe today. It becomes obvious that we design technology that works in the shortest time possible, and the optimum way to do that is to use the fastest thing there is – light[1]. This would bring about a revolution in the way microprocessors, computers and technology is used; data processing rates would exponentially increase, and at the same time, it could be made possible to break *Moore’s Law*, as the number of transistors incorporated in the chip would not need to be doubled. We could obtain a far more efficient microprocessor by using laser technology. The problems associated with current microprocessors is that they involve complicated circuitry, their parts do not last for long as they are prone to oxidation, and they produce a lot of heat (and are vulnerable to heat) due to the resistance electrons face when they travel through wires. The problem investigated in this paper is of how to design a laser-microprocessor, and of how to increase data transmission rates by using appropriate algorithms. The result obtained was that *yes*, it is possible. The paper focuses on a single unit of a laser microprocessor, and the concept can be further extended to observe how these different units can be logically assembled to create a complete microprocessor [5]. The benefits of these microprocessors would be:

- It will be possible to execute intricate calculations
- It will be possible to simulate complex equations

- It will be possible to use these microprocessors for artificially intelligent machines so that they can be more intelligent and useful

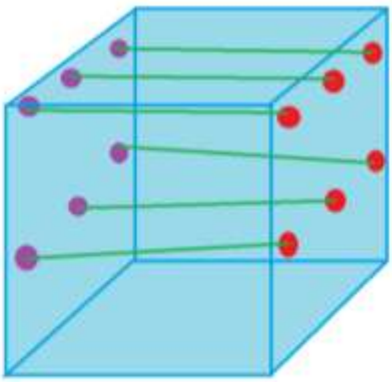

Fig2: Schematic diagram of the proposed microprocessor with lasers

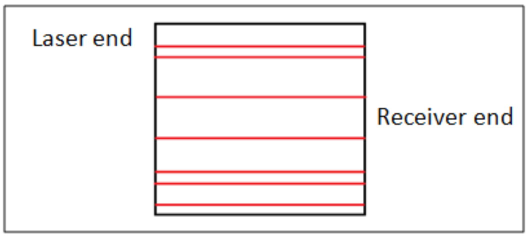

Fig3: Schematic diagram of the proposed microprocessor with lasers at transmitters and receivers

There would be a simple array of a fixed number of lasers one side, and the same number of receivers on the side exactly opposite. The lasers would turn on and off specifically using an algorithm, several hundred or thousand times per second to transmit data; the receivers would receive the signal from the lasers, and convert it to binary data using an algorithm described further ahead[1].

At first, it would be decided at the 'laser end' (which we shall refer to as A for now) what data to send, in binary. Then at point A, it would be converted to denary, which the lasers can then use to transmit data to the receivers(which we shall refer to as B for now); the receivers can then convert the denary data back to binary, and this data can be used for execution of instructions from point B.

III. ALGORITHM

Let it be assumed that the binary string '1101011010' needs to be transmitted from A to B. The binary data would be converted to denary:

$$2^9 + 2^8 + 2^6 + 2^4 + 2^3 + 2^1 = 858$$

At that moment of time, laser '858' would be on, and receiver '858' would receive this data at B and convert it back to '1101011010'(assume at this moment that there are 1023 lasers and receivers in the microprocessor).

If the data to be transmitted were '1011010101010011010101110101010100', the data would have to be segmented every 10 bits, starting from the left. In this case, it would be '1011010101', and '0100110101', and '0111010101', and '010100' (the last one would have to be padded with zeroes in the beginning, so as to make it ten bits long without changing its value; thus it would become '0000010100'). The resulting four denary numbers would be:

725, 309, 469, 20 respectively. Thus, 725 will be sent first from A, then 309, then 469, then 20; consequently, at point B, the denary numbers would converted back to binary, and the resulting binary numbers would be concatenated. The highest binary number that can be sent at a time would be '1111111111', thus the resulting denary number would be:

$$\sum_{n=0}^{9} 2^n = 1023$$

1023 lasers would be required in the microprocessor.

It is very clear that the segmentation of data requires buffering of streams with a calculated delay. A delay program for the delay is listed below:

Label	Instructions	T-states
	LXI D,COUNT	10T
L1:	DCX D	6T
	MOV A,D	4T
	ORA E	4T
	JNZ LI	10/7 T

- No. of t-states requierd for an iteration

=T-states (DCX D)+T-states(MOV A,D)+T-states(ORA)+T-states (JNZ)
=6+4+4+10=24 T-states

- For last iteration it requires

= T-states (DCX D)+T-states(MOV A,D)+T-states(ORA)+T-states (JNZ)
=6+4+4+7
=21T-states

This amount of delay is enough for the segmentation and buffering of data.

IV. CONCLUSION

This design of microprocessors would increase clock speeds by an extraordinary amount. The objective of increasing data transmission rates has been met, although it is possible to invent an even more efficient algorithm to transmit the data, and it is possible to work on a design that further reduces heat losses. The design envisioned for the microprocessor has been described to the greatest extent in the paper.

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