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| **External Project Report on**  **Computer Organization and Architecture**  **(EET 2211)** |

**Statistical Calculator in 8086 assembly language**



**Submitted by**

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**B. Tech. CSE 4th Semester (Section – 2341-2P1)**

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# Declaration

We, the undersigned students of B. Tech. of **CSE** Department hereby declare that we own the full responsibility for the information, results etc. provided in this PROJECT titled “**Statistical Calculator in 8086 assembly language**” submitted to **Siksha ‘O’ Anusandhan Deemed to be University, Bhubaneswar** for the partial fulfillment of the subject **Computer Organization and Architecture (EET 2211)**. We have taken care in all respect to honor the intellectual property right and have acknowledged the contribution of others for using them in academic purpose and further declare that in case of any violation of intellectual property right or copyright we, as the candidate(s), will be fully responsible for the same.

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# Abstract

This project presents the design and implementation of a statistical calculator using 8086 Assembly language. The calculator performs essential statistical operations, including calculation of mean, median, and standard deviation. By leveraging the efficiency and low-level memory management capabilities of Assembly language, this calculator demonstrates the potential for high-performance statistical computations in resource-constrained environments.

The calculator's design focuses on algorithmic efficiency, accurate calculations, and user-friendly input/output operations. This project showcases the application of 8086 Assembly language in statistical analysis and provides a foundation for further development of statistical tools in Assembly language programming.

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# **1. INTRODUCTION**

In the realm of statistical analysis, calculators play a vital role in simplifying complex calculations, enabling users to focus on interpreting results rather than tedious computations. This project aims to design a statistical calculator using 8086 Assembly language, a low-level programming language that provides direct access to hardware resources.

**Why 8086 Assembly Language?**

**1. Efficiency**: 8086 Assembly language allows for optimized code, resulting in faster execution times.

**2. Low-Level Memory Management:** Direct access to memory enables efficient data storage and manipulation.

**3. Educational Value:** Learning Assembly language programming helps developers understand computer architecture and software hardware interactions.

**Statistical Calculator Functionalities**:

The calculator will perform the following statistical operations:

1. **Mean Calculation**: Calculate the average value of a dataset.

2. **Mode Calculation**: Find the most frequent value of a sorted dataset.

3. **Standard Deviation Calculation**: Measure the spread or dispersion of a dataset.

**Project Goals:**

1. Design an efficient statistical calculator using 8086 Assembly language.

2. Implement accurate and reliable statistical calculations.

3. Provide a user-friendly interface for input and output operations.

# **2. Problem Statement**

Design a statistical calculator in 8086 Assembly language to perform mean, median, and standard deviation calculations on a set of numbers.

**Identification of Input and Output Variables:**

**Input Variables:**

1. Set of numbers (dataset)

2. Choice of statistical operation (mean, mode, variance or standard deviation)

**Output Variables:**

1. Calculated mean

2. Calculated mode

3.Variance

4. Calculated standard deviation

**Constraints:**

1. Programming Language: 8086 Assembly language

2. Numerical Representation: Integer or fixed-point representation (floating-point operations might be challenging)

3. Limited Memory: 8086's memory constraints

4. Input Size: Limited by memory and programming constraints

5. Error Handling: Handling invalid inputs, division by zero, or calculation overflows .

**Goals and Challenges:**

**Goals:**

1. Accurate calculations

2. Efficient algorithms

3. User-friendly interface

**Challenges:**

1. Implementing complex calculations in Assembly language.

2. Managing memory limitations .

3. Handling potential overflows or underflows.

By understanding these constraints and challenges, we can design an effective statistical calculator in 8086 Assembly language.

# **3. Methodology**

# **4. Implementation**

# **5. Results & Interpretation**

**6. Conclusion**

The statistical calculator designed using 8086 Assembly language provides a functional tool for calculating mean, median, and standard deviation. This project demonstrates the application of Assembly language programming in statistical analysis, showcasing its potential for efficient numerical computations.

**Key Takeaways:**

1. Assembly language programming can be used for statistical calculations. 2. Efficient algorithms and data representation are crucial for accurate results.

3. The calculator can be extended to include additional statistical functions.

**Future Enhancements:**

1. Support for floating-point numbers

2. Additional statistical functions (e.g., variance, correlation)

3. Improved user interface and input/output handling

The statistical calculator serves as a foundation for further development and exploration in statistical analysis using Assembly language programming.

# **References**

**1. Barry B. Brey** - "The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, and Pentium Pro Processors"

**2. Muhammad Ali Mazidi** - "The 8051 Microcontroller and Embedded Systems"

**3. Kenneth Morse** - "The 8086/8088 Primer"

**4**. Online resources and documentation on 8086 Assembly language programming

**5**. Statistical analysis and calculation resources (e.g., textbooks, online tutorials)

These references provide a foundation for understanding 8086 Assembly language programming and statistical analysis, supporting the development of the statistical calculator

# **Appendices**

## Appendix A: 8086 Assembly Language Syntax and Instructions

## - Instruction set architecture

## - Syntax and semantics

## - Examples of common instructions

## Appendix B: Statistical Formulas

## - Mean:

## - Mode: most frequent value of sorted dataset

## - Standard Deviation:

## Appendix C: Sample Datasets

## - Example datasets for testing the calculator

## - Expected results for mean, median, and standard deviation calculations

## Appendix D: Code Listings

## - Complete code listings for the statistical calculator

## - Comments and explanations for key sections of code

## These appendices provide supplementary information and resources to support understanding and implementation of the statistical calculator.