[[1]](#footnote-1)

Fortran Overview (March 2021)

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*Abstract*— This paper will go over the Fortran language, difference between the Fortran language and C language, and a list of applications that use the Fortran language. Throughout my paper you will find my research and findings on these various topics.

# INTRODUCTION

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HIS paper will go over a the research I have found on Fortran. Thus, this paper will cover the basics of Fortran. Essentially, we will be covering the fundamentals of Fortran by giving a description or overview of the language. After this we will be covering the difference between the Fortran language and C language, which may include touching the fundamentals again and its basic difference between the C language. Finally we will be able to cover the applications of Fortran and when it is used. By the end of the paper you will have a developed understanding of Fortran and its basic difference between other languages and its applications. This will all be presented through the research I have done in a week’s span on these languages.

# Fortran Language

Fortran which comes from Formulate Translating System, mainly is used for scientific and numeric computing. As a background information or history, Fortran was developed by IBM in the 1950s to be used for scientific and engineering purposes and became popular in these areas as it had a high performance for computing. This is mainly due to the fact that it supported many different types of programming such as: structed, array, modular, generic, object-oriented and concurrent programming.[[2]](#footnote-2) Another reason as to how Fortran language became so groundbreaking in the 1950s was because prior to Fortran they were programming in machine language. So with the development of Fortran they were able to much more efficient, almost as efficient as the programs itself. By having efficient programs, it would also help with any financial problems within computers or programming in the 1950s. This development helped move programmed past the small machine language to a more generational program that could be easily used and understood.[[3]](#footnote-3) As this will be discussed later on, but Fortran is also mainly used in fields like space, physics and weather modeling. One reason I believe why Fortran has come up in this class is because Fortran remains to be a widespread today for writing benchmark tests for some of the world’s fastest computers.[[4]](#footnote-4)

# Fortran versus C Language

Occasionally C can be seen as a leader of performance within coding languages, however it is actually Fortran that tends to be faster than C. To put it simply, C just isnt quite fast enough. One way Fortran is faster than C is through function arguments, this is because Fortran’s function arguments don’t alias and have an array type where as in C arrays there are pointers. This one really came down to the cost of the pointer arithmetic.[[5]](#footnote-5) Another comparison between the two languages would be the difficulty in understanding the code. For instance, Fortran is much easier for beginners to learn C. This is because Fortran follow a more “mental model of the computer” which can be simpler to understand. Because Fortran doesn’t really use pointers, beginners won’t have to learn about these facets within programming making it much easier to work with. Also, another difference would be with their design. Fortran was designed to work with numerical computations and make it easier which allows a more well-defined character set for these types of operations. This would include simplify its results, ensuring blanks aren’t significant, as to not mess up any computations, and being linked with the library wont require any compiler options. Whereas in C you’d have to import certain libraries in order to use both or have syntax errors when doing computations. Ultimately, Fortran is designed for numerical computations as it much faster and processes it much better, whereas C is a language better designed for other purposes like system programming.[[6]](#footnote-6)

# Fortran Used

As stated before, Fortran is used within space, physics and weather modeling. So for example, NASA uses Fortran as it still can serve to have a critical role in a few of its project.[[7]](#footnote-7) Another example would also be the fact that some physicist still use Fortran. Fortran is still used by physicists and this is because it is still seen as a dominant language for larger scaled simulations of physical systems. This would include systems like astrophysical modeling of the universe like stars and galaxies, as well as hydrodynamics, molecular dynamics and electronic structure calculation codes.[[8]](#footnote-8) As you can see, many of the listed above things would include a high amount of numerical computation and this is where Fortran, as expressed throughout this paper, comes in handy. It can perform quickly and accurately for larger scale projects or research, which is where it is mainly used today.

# Conclusion

As researched throughout this paper, Fortran is shown to be one of the leading languages in numerical computation. However, it is not one of the leading languages but is still very relevant in today’s technology as we continue to use it for research and testing. Fortran by comparison in usage, may not be used as much, however has brought the world out of machine coding and into a more modern way of coding which has helped develop more and new languages befitting different purposes.

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