Proof of Equivalence of Complexity Classes and Other Relations

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ABSTRACT

As we have presented our functional hypothesis of complexity classes in previous review, we are to present the full mathematical proof of the relations between complexity classes.

INTRODUCTION

The notion of complexity classes was before presented by Stephen Cook [1], as we know functions can be polynomial [2, 3] and non-polynomial [4], as well as arbitrary [5].

THEOREM

Let *f(x)* be the sought non-polynomial function, then we have:

$$P =?\ NP.$$

We also know due to our functional hypothesis [6] that:

$$f(P)=NP.$$

PROOF

Let's assume that:

$$P \neq NP.$$

Then:

$$P=f^{-1}(NP)\neq NP \vee NP=f(P)\neq P \rightarrow f(f^{-1}(NP))=f(P)=NP\neq NP,$$

which is a contradiction.

For the second inequality we have:

$$f^{-1}(f(P))=f^{-1}(NP)=P\neq P,$$

which is also a contradiction, then we get:

$$NP\neq NP \wedge P\neq P \rightarrow P=NP.$$

CONCLUSION

We have made a great approach towards proving the equivalence of complexity classes P and NP according to Rabin-Scott conjecture or functional hypothesis.

REFERENCES

1. Cook, S. (2000). The P versus NP problem. *Clay Mathematics Institute*, *2*(6), 3.
2. Parrilo, P. A., & Sturmfels, B. (2001). Minimizing polynomial functions. *arXiv preprint math/0103170*.
3. Brun, T. A. (2004). Measuring polynomial functions of states. *arXiv preprint quant-ph/0401067*.
4. Goubault, E., Jourdan, J. H., Putot, S., & Sankaranarayanan, S. (2014, June). Finding non-polynomial positive invariants and Lyapunov functions for polynomial systems through Darboux polynomials. In *2014 American Control Conference* (pp. 3571-3578). IEEE.
5. Zhang, C., Liu, W., & Wang, L. L. (2017). A new collocation scheme using non-polynomial basis functions. *Journal of Scientific Computing*, *70*, 793-818.
6. Syzdykov, M. (2021). Functional hypothesis of complexity classes. *Advanced technologies and computer science*, (3), 4-9.