Automated Conjecturing in Continued Fractions

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Mathematical research has always been done by humans - mathematicians with the help of their thinking abilities. From the 1950s onwards, computers began to be used to perform a variety of tasks in mathematics and therefore the field of computational mathematics formed. Despite this, most of the research work remained in the hands of mathematicians. Thus creating a gap between the capabilities of the computer and the usage of computers. This work studied computational mathematics in the field of continued fractions and identities involving them. With the aim of narrowing the gap and bringing more computational techniques. The study yielded two approaches that have been studied and tested, the first one is a new algorithm for improving the computational speed of evaluating continued fraction. The second is an optimization-based method for finding identities of continued fraction. Both have been implemented in software and tested. The first algorithm consists of a number of techniques that have been shown to evaluate continued fractions faster than the existing algorithm. Evaluation of continued fractions is fundamental part of automated conjecturing, and take a significant portion of the runtime of algorithms developed previously by the lab I researched in. Therefore, every improvement in evaluation time can be expressed in improved performances. The second algorithm is the first of its kind in terms of using optimization techniques in automated conjecturing. We believe that this algorithm can open a new direction of research and can lead to the development of new algorithms.

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