Journal Report 2

9/9/19-9/16/19

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Daily Log

Monday September 9

Began working on how to prove a lower bound of Maximum Independent Vertex Set for cases of $\{-1, 0, 1\}^3$ with varying amounts of 0s.

Tuesday September 10

Began researching more into J-Link and its implementation. Looked more into effective algorithms for approximation of Maximum Independent Vertex Set. Continued work on cases of $\{\text{-}1,0,1\}^3$ with varying amounts of 0s. Tried playing around with pencil/paper and finding patterns.

Thursday September 12

Finished proof for bound on $\{\text{-}1,0,1\}^3$ with varying 0s. Did this by counting the amount for certain vectors and picking specific vectors and all their multiplicities.

Timeline

Date	Goal	Met
9/2	None	N/A
9/9	Have functional code and plug in numbers	Yes, I have code that works for about 124 distinct vectors by plugging things into Mathematica.
9/16	Find a lower bound for {-1,0,1}^{3} with varying amounts of 0s	Yes, I found that of the $6n^2 + 12n + 8$ terms (n being the number of 0s), I can always make $2n^2 + 4n + 2$
9/23	Find a lower bound for {-1,0,1}^{3} with varying amounts of 1s and -1s as well	
9/30	Find an effective approximation algorithms for Maximum Independent Vertex Set	

Reflection

This week, I looked to build off some of my data from last week. Last week my best data came from the set $\{-1, 0, 0, 1\}^3$ and I looked to prove that adding more 0s would just converge the Maximum Independent Vertex Set to 0. I was able to do this by analyzing how many times each vector appeared. Vectors with 2 0s appeared n^2 times, vectors with 4 0s appeared n times, and vectors with no 0s appearead 1 time. I found the set of vectors

$$(0,0,1),(0,0,-1),(1,1,1),(-1,-1,-1),(0,1,1),(0,-1,-1),(1,0,1),(-1,0,-1)$$

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This set of 8 vectors gives you a value of $2n^2 + 4n + 2$, which is just $\frac{2}{3}$ less than a value of $\frac{1}{3}$.

Moving forward, I'm changing my timeline for the 23rd as I will look to expand on what I did this week. I look to find a lower bound when we vary the number of 1s and -1s as well. I think some combination of $1s$ and $-1s$ may possibly yield a better upper bound than what I have previously calculated.

As these sets get larger and larger, I'll be needing a more efficient way to not calculate, but approximate Maximum Independent Vertex Set. There's no guarantee that this will be effective as the error ratio may be much too high, but I believe that it is worth giving a shot to. I will research algorithms that have the best combination of time complexity and correctness.