The desired goal was to develop an innovative bicycle theft protection device that provides similar standards of protection against theft as popular products while greatly reducing the user effort and involvement in handling one's bike lock.

Our design process consisted of three major stages. First we defined the problem as an overall inconvenience in the methods of protecting bikes from theft. We saw that there is a need in the market for a lock that supplies adequate protection while being quick and easy to engage and transport. Secondly, we gathered information on the most common ways people employed locking devices as well as their pros and cons. This was done through surveys, interviews, and observation. Thirdly, we generated and evaluated alternatives through group storming sessions to create a lock that met all the design requirements.

Once a random sampling of various bicycle frame dimensions was gathered and analyzed, SolidWorks was used to create a model which would fit most standard frames based on diameter and distance apart. This model was then coupled to Abaqus to provide stress analysis for a load on the pin (figure 3).

Analysis of stress on the main pin, which is a point of weakness, showed that SAE1041[3] steel should be used for this part to withstand loads over 500lbs. The rest of the components would be manufactured from ANSI stainless steel-grade 304[3] to provide superior strength against applied forces and protect against corrosion.

The ease of use was tested through a timed comparison of locking and unlocking both a U-Lock and the GO-Lock. Trials began with the key in the users pocket and ended when the lock was either securely engaged or disengaged and stored for transport. A standard U-lock takes approximately 12 seconds to lock and 11 to unlock while the GO-Lock design requires less than 3 seconds to lock and 4 to unlock.

Measurements show that the GO-Lock fits approximately 80% of all beach cruisers and BMX bikes. Based on material and machining costs this product falls within a reasonable price range. Testing also proves that this product is easy to use and requires less than a third of the time to lock and unlock compared to the standard U-Lock. In general, the design is simple, cost effective and time efficient.

Acknowledgments

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References

[2] Picture in figure 2 from Kryptonite website: www.kryptonitelock.com