CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

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Project Number

S0904

Project Title

Wi-Fi Wizardry! Improving Wireless Network Signals for Multiple Home Computers

Abstract

Objectives/Goals

The real-world objective of this project was to improve the wireless reception of two personal computers by building and testing a parabolic reflector to collect, focus, and extend the range of a Wi-Fi (or wireless) router's radio waves -- thereby improving signal strength and bandwidth. Such reflectors have been used to effectively, if not actually, amplify wireless network signals through focusing radio waves for computers (as well as light and sound waves in other applications), thereby improving Internet connectivity and the downloading and uploading of information.

Methods/Materials

One control computer (a wired desktop computer adjacent to the router, both located on the first floor of a home) and two experimental computers (a wireless-enabled laptop computer on the second floor and a wireless-enabled home-built desktop computer on the third floor) were used to test their signal strength and bandwidth without and with a home-built parabolic reflector that was added to the existing router. This router had a state-of-the-art internal antenna. Over seven days, both quantitative and qualitative data were gathered.

Results

With the use of the parabolic reflector, both experimental computers showed improvements in the definitive metrics of signal strength and bandwidth on a daily basis and when the data was averaged. In fact, the gains were most impressive for the experimental computer on the third floor and farthest from the reflector-and-router assembly. For example, regarding bandwidth, this experimental computer improved most from an averaged ping rate of 67 ms to 64 ms and an averaged download rate of 2.58 Mbps to 2.60 Mbps. Moreover, this farthest experimental computer closely approached the fastest averaged download rate of the control computer, which was 2.61 Mbps.

Conclusions/Discussion

The conclusion, based on the data for both experimental computers, is that a parabolic reflector can improve the wireless network for computers that are separated from a router by significant distances and obstacles. This experiment sought to build upon previous research and expand knowledge by testing a smaller, space-efficient reflector with multiple distant computers, real-world obstacles, and a router that has an internal antenna. Such routers are the present state and possibly future trend for consumer routers.

Summary Statement

This project examined if a parabolic reflector would improve the wireless network for multiple wireless-enabled computers that are separated from a Wi-Fi (or wireless) router by significant distances and obstacles.

Help Received

Parents helped to purchase supplies and drive to libraries for research purposes.