



CALIFORNIA STATE SCIENCE FAIR 2012 PROJECT SUMMARY

Name(s) Ayesha M. Rashed	Project Number J1419
Project Title Security through Obscurity (Steganography)	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this project is to determine (a) how much color variation in a digital image is noticeable by average human eyes, (b) how can digital images hold covert information within the un-noticeable band of color variation, and finally (c) how the covert information embedded in a digital image can be kept secure?</p> <p>Methods/Materials (1) Standard images, used in Digital Signal Processing (DSP), were downloaded from the USC (SIPI) website. (2) Python and Python Image Library (PIL) was setup on my computer. (3) An electronic survey was conducted to determine the human ability to detect the pixel color variation of different levels by different group of people based on their ages, gender and geographical disposition. (4) A python steganography program was written to merge digital information into an uncompressed digital image. (5) To extract the information out of the impregnated image, a decoder program was written in python to test the integrity of the data. (6) To make the covert digital information embedded into the uncompressed image, secure and unbreakable without the knowledge of the original pass-phrase or encoding seed, different methods like seeded pseudo random functions and pass-phrase based 2D location function were used to distribute the data.</p> <p>Results (1) The survey results show that in normal portrait picture about 70% people do not find 3 bit color variation detectable. (2) In high contrast pictures 70% people do not detect variation as high as 5-bits. (3) Variation of RGB color channels in the solid colors is more observable. (4) The color variation is less observable in low intensity regions of a digital picture. (5) Security of the covert data is virtually unbreakable by distributing it in two dimensional (2D) pixels space.</p> <p>Conclusions/Discussion Through this project it is proved that up to 3 lower bits of the each of the RGB color channels of the pixels of common digital images can safely be changed, without losing noticeable colors and texture details. This available bit space can be used to compress the digital images or hold covert digital information. It is shown that the pictures of high contrast and dynamic range can hold more covert information. The steganography techniques proposed in this project can be used in applications like copyright, watermarking of intellectual property, and keeping personal data secured through obscurity on unsecure mediums like USB drives, CDs, etc.</p>	
Summary Statement Securely embedding covert digital information in an un-compressed digital picture.	
Help Received Dr. Rashed Z. Bhatti supervised and helped in Python programing.	