Dissertation Idea Paper

Automated Coin Grader

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Introduction

The focus of this study is to develop the systematic framework for an imaging system that is capable of consistently grading or determining the condition of rare collectibles.

Accurately identifying, grading and then determining the authenticity of rare collectible items such as coins, stamps, cards, comic books and artwork is often a subjective non-automated process conducted by human Appraisers or Graders. The Appraisers and Graders are usually experts in their respective fields that draw on years of experience, large established pools of domain knowledge, opinions of other experts in their field and comprehensive comparisons to other 'works' in the field.

Problem Statement

Assigning a grade to coins, or other rare collectibles, helps to establish the condition and the state of preservation of the collectible. Accurately determining the condition of a coin is significant as it is a large contributing factor to determining the value of a collectible in the marketplace.

On many rare coins a difference of a single grade can often mean thousands of dollars in difference in the value of the asset. Sometimes these discrepancies in grades are simply errors by the graders due to poor training, poor lighting, fatigue or misinformation. But many times the discrepancies can be attributed to dealers under-grading items so that they can purchase them for an amount that is cheaper than what they are worth or over-grading them so that they can sell the items for more than what they are worth.

Relevance and Significance of the Research

Rare coins are presently graded by human hand and eye inspection that often produces varied, inconsistent and sometimes dubious results. In instance one grader may assign a grade of Very Good to a particular rare coin and another grader may assign a grade of Fine to the same coin.

The problem of inconsistency in the grading of collectibles is not simply limited to novice collectors or novice dealers. An excellent website that demonstrates the great diversity of grading opinions is The Stu Joe Collection – Grading Challenge. On this site users are asked to assign a grade to a coin that appears as an obverse and reverse scan. The vast majority of votes come from seasoned collectors and experienced coin dealers that frequent the RCC and the PCGS forums. In the 7 grading challenges conducted thus far the grading results opinions from the voters loosely form bell curves around the ideal grade.

A major goal of the system designed in this study is produce a system in which grading will always be consistent as no human error factors or financial incentive will be introduced into the grading process.

Scope and Limitation of Study

Numerous similarities exist between the different types of collectibles (stamps, coins, comic books & cards). For instance each of these collectibles has a defined set of grading criteria, each has a large base of domain knowledge, many experts exist is each area, high priced rarities exist in each of these collectible markets, 3rd party grading companies exist that offer grading services and there is great incentive to get authentication and grading right.

This study will concentrate on the identification, authentication and grading of one area of collectibles, US coinage. For testing purposes of this study attention will be placed on the limited denomination of United States coinage that include Lincoln Cents from 1909 to present.

Preliminary Research questions investigated

- How reliable are the 3rd party grading services?
- How diverse are the interpretations of experts when it comes to grading rare collectibles?
- Is grading an art or a science?
- Can a system be built that can reliably and consistently determine the grade/condition of a rare collectible?
- Is present day scanning technology sufficient enough to provide images that are robust enough?
- Is it possible to train a system with enough expert knowledge from the collectible domains to properly perform feature extraction matching?
- Does specialized hardware have to be developed to accomplish the goal?

Research Approach and Timeline

This study will be conducted from January 2002 until April 2003.

Phase	Description	Estimated Timeframe
1	Document Project Framework and produce a working plan for the technical features to be contained.	Jan 2002 – March 2002
2	Work with students in CS 631Q on developing the first part of the grading software and determine Hardware & Software resource requirements.	March 2002 – May 2002
3	Review the results of CS 631Q, document and analyze the results	May 2002 – Sept. 2002
4	Interact with Coin Grading Industry Experts, review the literature and refine the project scope.	May 2002 – Dec. 2002
5	Define the project requirements for the CS615-616 Team members.	May 2002
6	Work with students in CS 615-616 on the second part of the grading system which includes the Construction of Prototype Databases (Graphic Images Databases, Valuation Databases, Counterfeit & Alternations Database)	Sept. 2002 – April. 2003
7	Work on Manuscript	Sept 2002 – April 2003
8	Internal Testing & Modification of CS 615-616 work and analysis of the results.	Dec. 2002 – Feb 2003
9	Write companion paper	April 2003
10	Defend Research Project	May 2003
11	Post Dissertation: Work with other teams to continue the development and to expand the scope of testing to other series and denominations.	Beyond May 2003
12	Live happily ever after	Post Graduation

Preliminary References:

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