Code Cracking: Who Murdered the Somerton Man

Group 142

Supervisors: Prof. Derek Abbot

Dr. Matthew Berryman

Students: Yami Li & Yifan Ma

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Outline:

1. Introduction

2. Motivations & Expectations

3. Previous Contributions

4. Outcomes

5. Specific tasks

- Code related

- Mass Spectrometer Data Analysis

6. Project Management

Introduction

Background: Who was the Somerton Man?

- Man found died in Somerton Beach, Glenelg

- Time: 1st December 1948

- Buried on 14th June 1949

- Identity remains unknown

HERE LIES THE UNKNOWN MAN WHO WAS FOUND AT SOMERTON BEACH 1ST DEC. 1948.

Introduction

Background: Dubious facts in this case

- Victim was **NOT** a local resident.

- Victim dressed well in midsummer and met his demise while sleeping.

- Found a hidden Paper scrap in his trousers.

Introduction

Background: Paper Scrap

- *Tamám Shud*: Means **FINISHED** in English.

- Proved to be part of the 'Rubaiyat of Omar Khayyam' book.
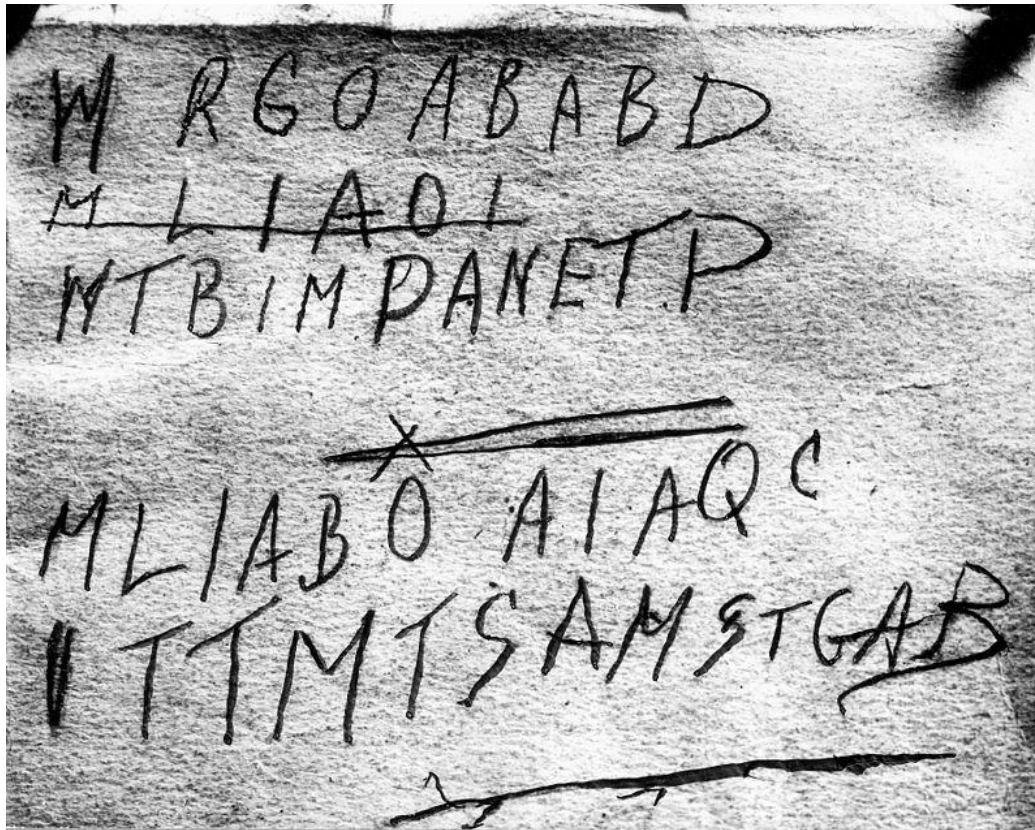
- Related book was found later.

Introduction

Background: Paper Scrap

- *Tamám Shud*: Means **FINISHED** in English.

- Proved to be part of the 'Rubaiyat of Omar Khayyam' book.

- Related book was found later, with a series of letters written on it.

- The case is then named as "Taman Shud Case"

Background: Mysterious code

Introduction

Background: Hair found accidentally

- A plaster model was made according to the victim's head.

- Victim's hair remained in the unformed plaster.

Motivation of project

1. Show respect for the dead man.

2. Public interest still remains high.

3. Engineers' advantages in statistics, information theory and data processing.

4. The victim was suspected of being a spy of Soviet Union.

5. Clear the accusation on the dead man, or prove it.

Expectation of project

1. Almost impossible to crack the code in a short time.

2. While it is possible to find out which language the code was indicating to.

3. Victim's hair may reveal the truth.

Previous Contributions

- SA Police: Provided initial investigations and related data.

- Australian Defense Force: Attempted to crack the code yet unable to crack.

- Chemical and biological analysis of the victim's hair.

- Final year project groups in UoA: Studied in this case since 2009.

Outcomes

1. By comparison, determine with which language the code was intending to express.

2. Find if segments of the code correspond to any regular expressions.

3. Generate plot graphs of the hair data and draw conclusions.
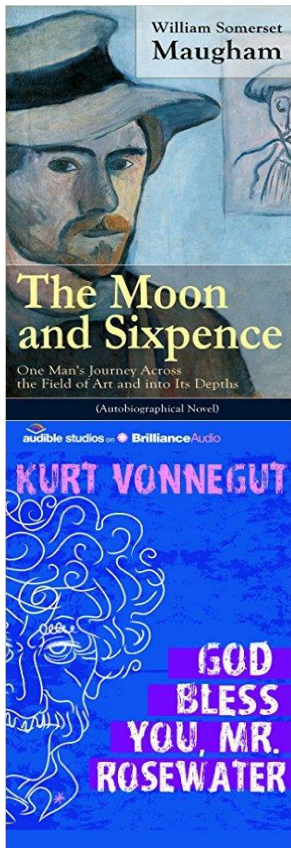
Specific Tasks: Code related

- Premise: The codes represents first letters of a series of words.

- First task: Prove that the code is for English words.
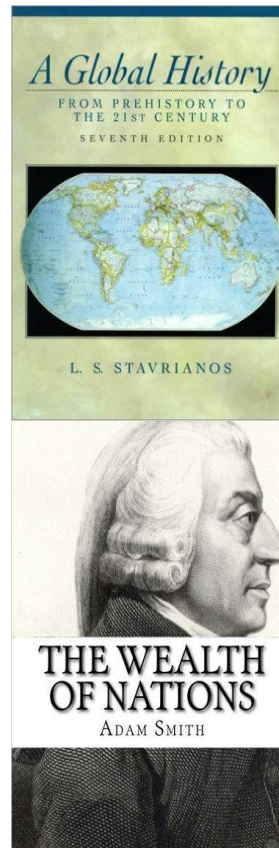
- Method: Big data Analysis.

Step1: Generate the library for comparison use.

- Choose one **well known book** which has multi language versions (English, Spanish, French, German, etc...)

Fiction range

History range

Comedy range

Economic range

Step2: Extract first letters

- Read all contents in using Java. Transfer the non-English letters if needed (For German and French).

- From every book, extract first letters of consecutive 50 words as an **Array**.

- Each book will be extracted 100 arrays of first letters without overlapping (lengths of book should be enough).

Text

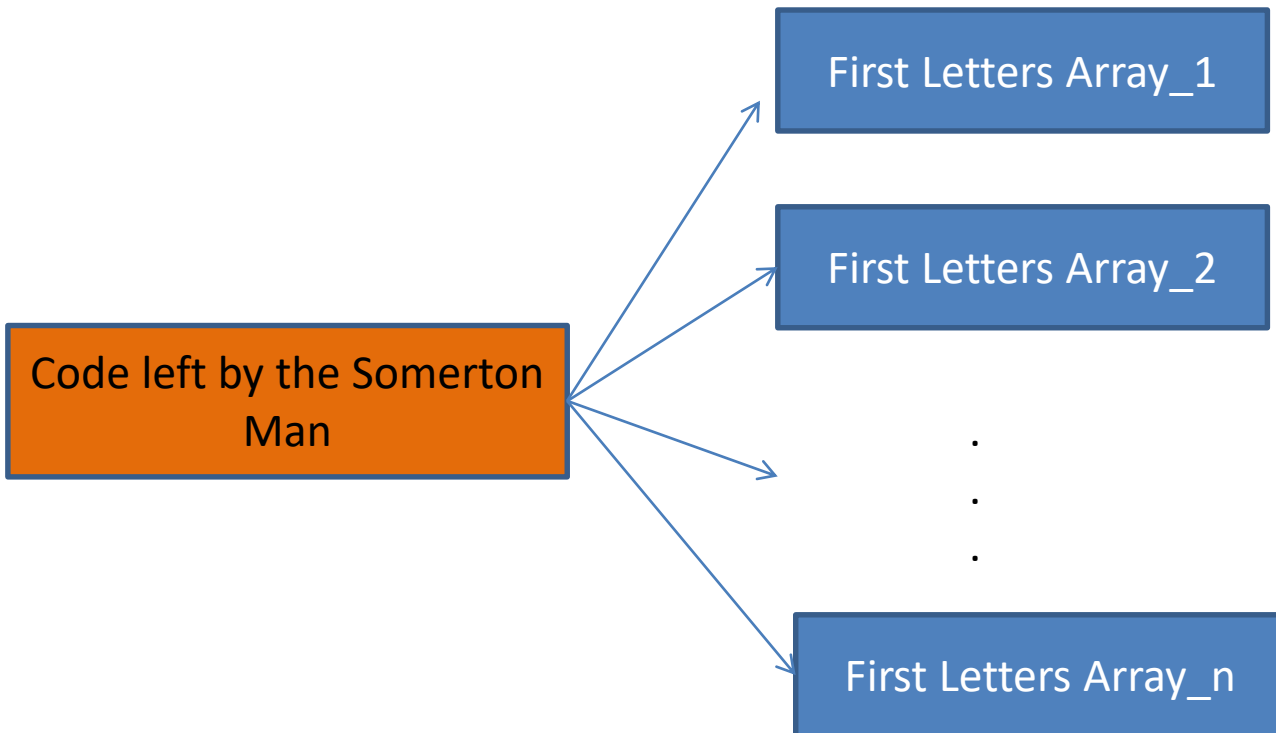I confess that when first I made acquaintance with Charles Strickland.......

Array

I, C, T, W, F, I, M, A, W, C, S.....

Step3: Do the comparison and calculate similarity.

Step3 (Cont.): Manifest bitwise and fuzzy comparison

Bitwise comparison Similarity

T, G, F, I, A, C, S, L.   C, G, F, I, K, C, S, L.   :   6 matched out of 8.

Step4: Analysis according to similarities

Based on the similarities it is reasonable to draw a conclusion that whether the code was indicating words in English or other languages.
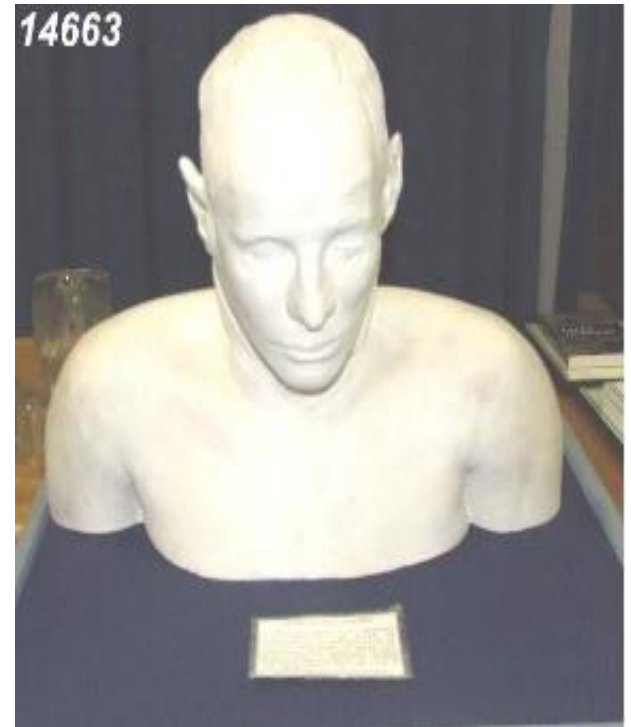
Big Data Analysis:

Step5: Specific analysis (Requires Step4's Outcome)

One specific language will be marked as what the code was intending to express.

Break code into small pieces and do the detailed comparison (2 words, 3 words, etc.).

Specific Tasks: Mass Spectrometer Data Analysis related. Introduction:

- Plaster cast made in 1949

- Hair extraction of Somerton man
  - From plaster cast

- Comparison with six other control samples
  - Selected at random from university students

<Source:www.sapolicehistory.org>

Specific Tasks: Mass Spectrometer Data Analysis related. Introduction:

- Inductively Coupled Plasma Mass Spectrometer ICP-MS

  - Used for micro-sampling of solid material for trace element and predominantly cation analysis

  - Adelaide Microscopy houses two Agilent ICP-MS instruments
  - ✓ Measured the level of different isotopes present in a sample
  - ✓ Burned the hairs with a laser and recorded the spectral elements

<source: www.adelaide.edu.au/microscopy/instrumentation/icpms>
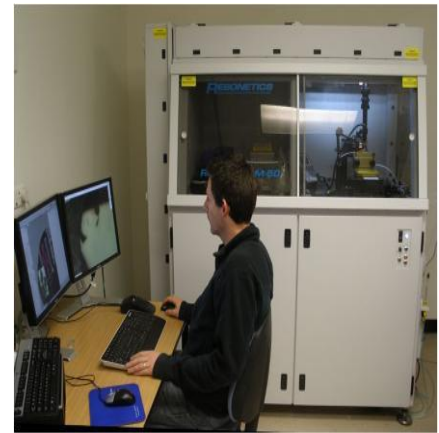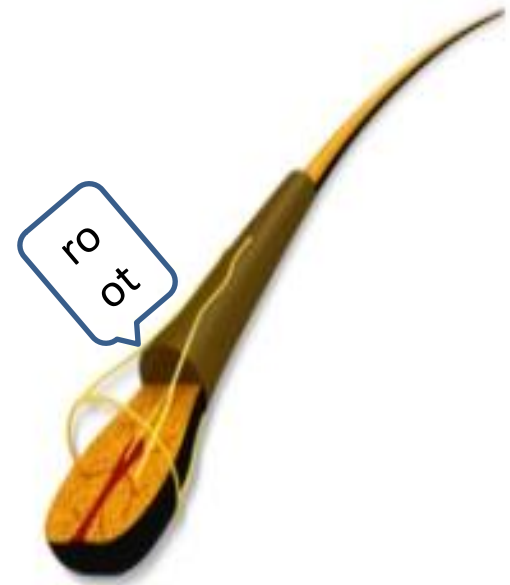
Specific Tasks: Mass Spectrometer Data Analysis related. Introduction:

Scan speed: 5um/s

- ## Control samples

  - Scan length: 1000um

  - Method length: 230s(30s background)

- ## Somerton man's hair

  - Scan length: 6054.6um

  - Method length: 1240.9s(30s background)

Specific Tasks: Mass Spectrometer Data Analysis related. Introduction:

- ## Hair growth rate: about 0.4mm/day
  - ### Control sample: 2.5 days
  - ### Somerton man: 2 weeks

- ## Hair root: most recent

root

<source:www.forensicmag.com>

Specific Tasks: Mass Spectrometer Data Analysis related.

- Element table

| These elements gained by laser ablation of hair mass spectrometer				
Li7	Ca43	Cu65	Zr90	Hf178
B11	Sc45	Zn66	Mo95	Au197
Na23	Ti47	Ga71	Ag107	Hg202
Mg24	V51	As75	Cd111	Tl205
Al27	Cr52	Se77	Sn118	Pb206
Si29	Mn55	Se82	Sb121	Bi209
P31	Fe57	Rb85	Te125	Th232
S34	Co59	Sr88	Cs133	U238
K39	Ni60	Y89	Ba137	

Specific Tasks: Mass Spectrometer Data Analysis related.

- ## Somerton man's hair data plot by Excel
  - Loss of data
  - Tendency unclear
  - Some traces out of range
  - Some traces changing curve are not obvious
  - Have difficulties in contrast
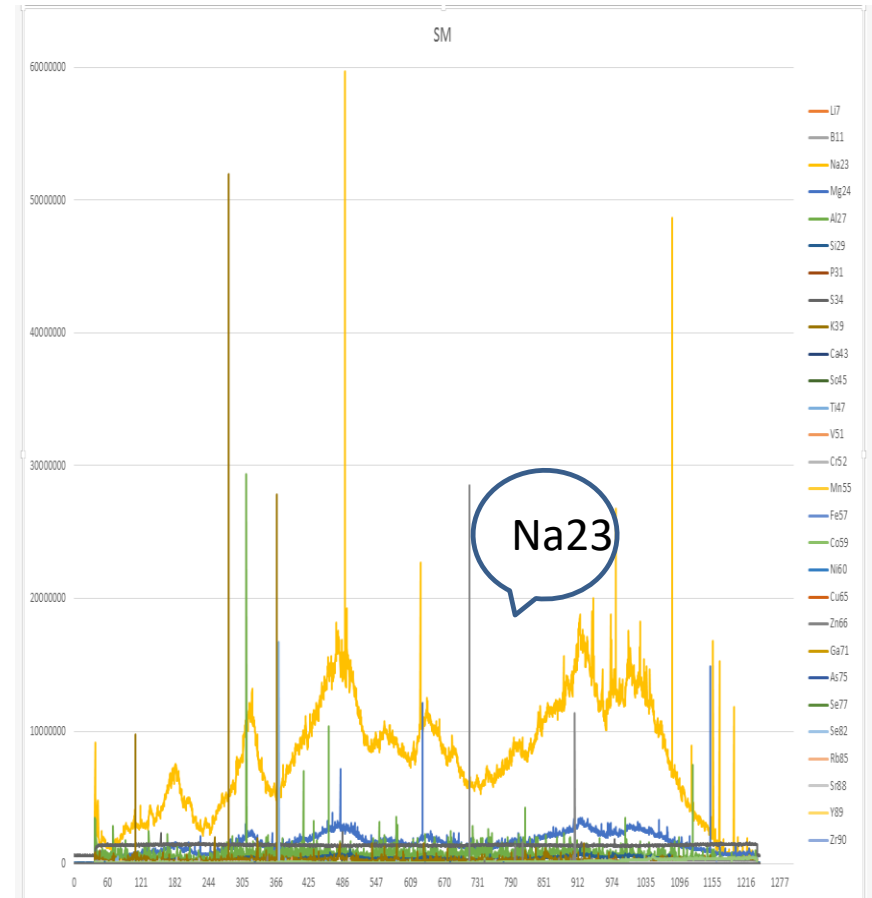
Specific Tasks: Mass Spectrometer Data Analysis related.

- ## Lead (Pb206)
  - Beginning at the left side of hair (root) through to the end

  - High level of Pb206

  - Reducing significantly near the time of death

  - Other isotopes e.g..
  Mercury(Hg 202), Silver(Ag 107), Aluminum(Al)…
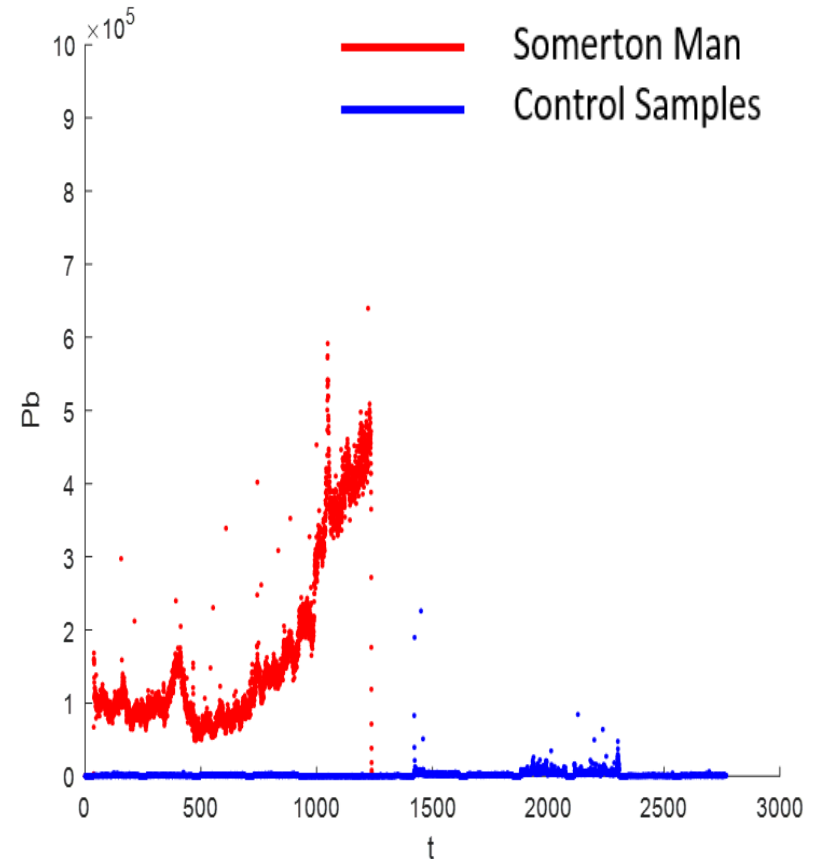
Specific Tasks: Mass Spectrometer Data Analysis related.

- Placed on glass slide (Impure)

  - Somerton man's hair with hair root
  - Hairs of control samples

- Placed on quartz slide (Pure)

  - Somerton man's hair without hair root
  - Hairs of control samples
  - A bit rest of Somerton man's unburned hair (the glass test remainder)
  - A slice of plaster (60 years ago)
  - A slice of plaster (recent)

- New data multiplies a constant to match with old data

Project Management: Task allocation

- ## Yifan

  - Code analyzing works (Aforementioned).

  - Making videos and webpages.

- ## Yami

  - Mass Spectrometer Data Analysis.

  - Project Management.

Project Management: Risk Management

Risk	Likelihood	Rating	Risk Estimation
1. Group member absent	Rare	Low	Medium
2. Group members' communications failure	Unlikely	Moderate	Medium
3. Data Loss	Slight	Negligible	Medium
4. Task completion time delay	Rare	low	Low
5. Bugs in code	Likely	Moderate	Medium
6. Matlab Unavailable	Rare	Moderate	Negligible
7. Group member leaves	Unlikely	Negligible	Negligible
8. Lack of resources	Rare	low	Low
9. Misunderstanding project tasks	Slight	Negligible	Low

Project Management: Milestones

Semester 1	Milestones
Week 1	Research Methods
Week 2-3	Research Information
Week 4-5	Proposal Seminar
Week 6-break	• 1st Thesis Draft • Research work
Week 7-8	• Coding work • Glass slide test analysis
Week 9-11	• Exhibition • Quartz slide test analysis

Week 12	• **Semester A Performance**
Week 13	Final Seminar

Semester 2	Milestones
Week 1	Review
Week 2-3	Project Exhibition Poster
Week 4-7	Final Performance
Week 8-9	Final Report
Week 10-11	Create YouTube Video
Week 12	Submit YouTube Video

Project Management: Cost

- Acquiring contents of books for code comparison.

- External hard drive to store data.

Project Management: Communication

- Weekly Group Meeting

- Email or Text Contact

- Data Exchange

- Project Wiki progress page

Reference

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Questions