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# Two-Dimensional Technology Profiling of Patent Portfolio

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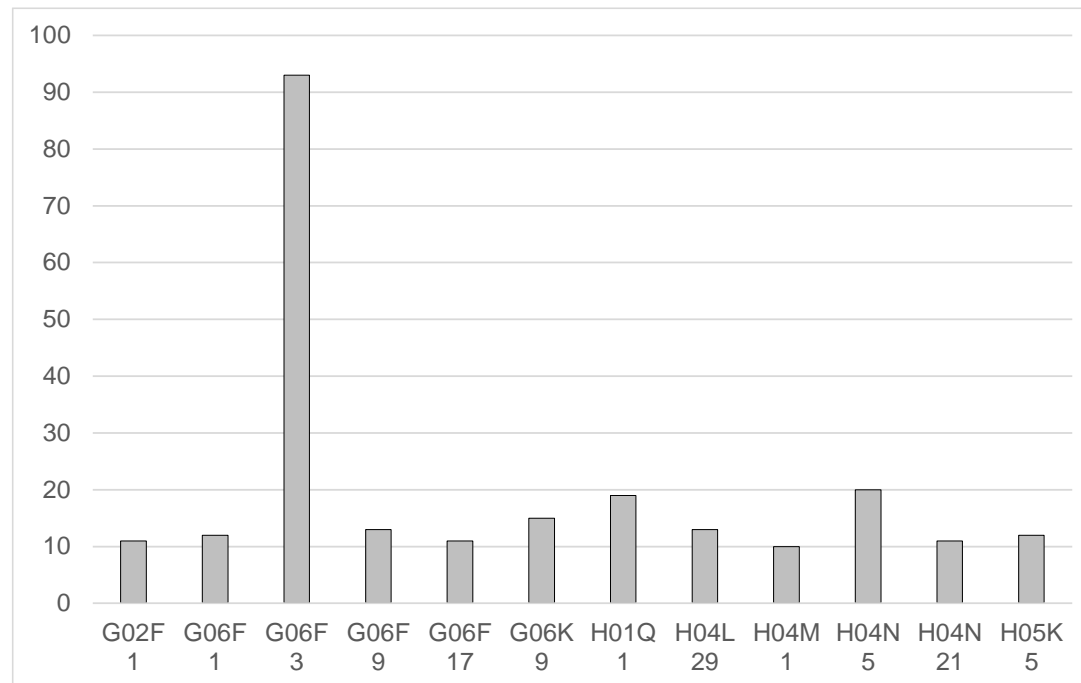
# Technology Profiling

- For a set of patents (i.e., patent portfolio) owned by an enterprise, an institute, a nation,...
- Its ***technology profile*** characterizes the various technologies covered by the patent portfolio
  - This study chooses to use the ***patent classification symbols*** for profiling patent portfolio



# Traditional 1D Profiling

- This approach is commonly known as *patent classification analysis* - an occurrence frequency distribution of patent classification symbols



# Drawbacks (1)

- A patent often has multiple classification symbols and each captures only a portion of the patent's technology content
- This study notices that there may be some “hidden” content not reflected by individual symbols, but by the joint assignment, or ***co-assignment***, of two or more symbols

# Drawbacks (1)

## MEANING OF US7,657,849 CLASSIFICATION SYMBOLS

Symbol	Title
G06F3	<b>Input arrangements for transferring data</b> to be processed into a form capable of being handled by the computer; Output arrangements for transferring data from processing unit to output unit, e.g. interface arrangements
G06F21	<b>Security arrangements</b> for protecting computers, components thereof, programs or data against unauthorised activity
H04M1	Substation equipment, e.g. for use by subscribers; Analogous equipment at exchanges
H04M 2250	Details of telephonic subscriber devices

# Drawbacks (2)

- The 1D technology profile may fail to differentiate some patent portfolios.
- For example,
  - Patent portfolio P includes two patents with classification symbols  $\{C_A, C_D, C_F\}$ ,  $\{C_B, C_D, C_F\}$
  - Another portfolio Q includes three patents with classification symbols  $\{C_A, C_D\}$ ,  $\{C_B, C_F\}$ ,  $\{C_D, C_F\}$
  - Both portfolios show an identical 1D profile  $\{C_A, C_B, C_C, C_D, C_E, C_F\} = \{1, 1, 0, 2, 0, 2\}$

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# 2D Profile Matrix

- A patent portfolio is said to have  $N$  classification symbols  $\{C_1, C_2, \dots, C_N\}$ ,
- Its profile matrix  $M$  is a  $N \times N$  square and symmetric matrix
  - $M_{mn} = M_{nm}$  is the frequency of co-assignment of classification symbols  $C_n$  and  $C_m$
  - $M_{nn}$  or  $M_{mm}$  is the frequency of assignment of classification symbol  $C_n$  or  $C_m$



# 2D Profile Matrix

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	A	B	C	D	E	F
A	1			1		1
B		1		1		1
C						
D				2		2
E						
F						2

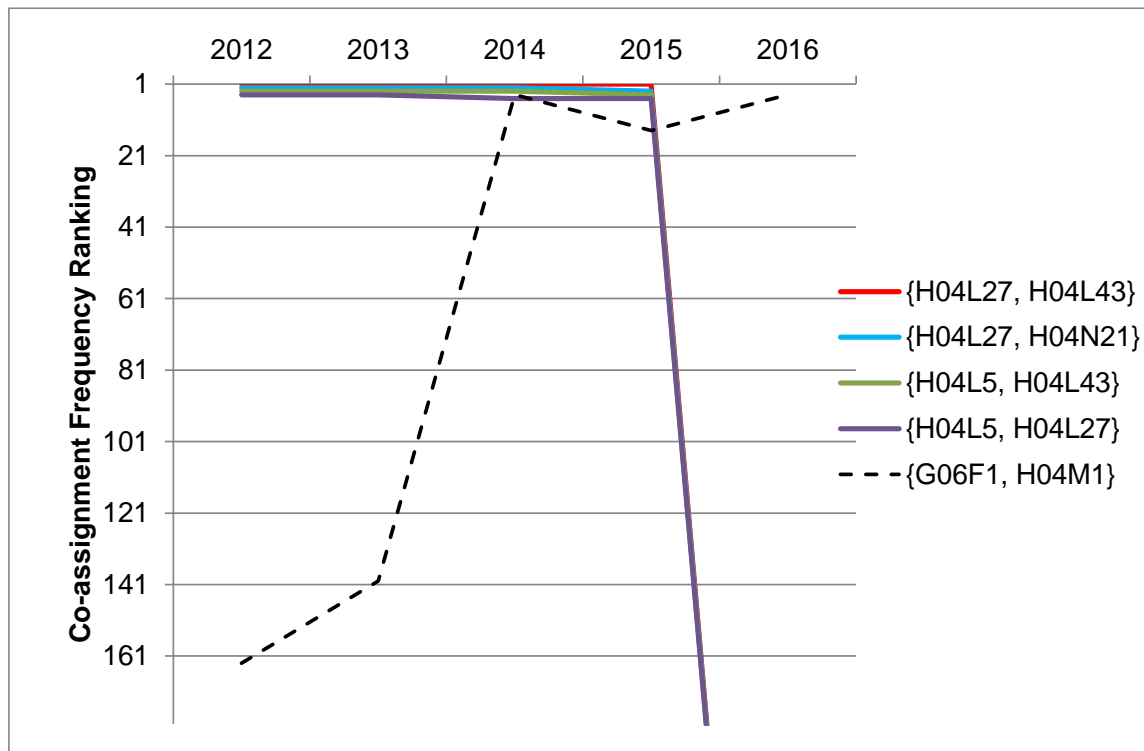
	A	B	C	D	E	F
A	1			1		
B		1				1
C						
D				2		1
E						
F						2

# Applications of 2D Profile Matrix

- Comparing the profile matrices of different entities to detect their degree of similarity or relatedness
- Monitoring how a patent portfolio evolves over time
- Detecting the emergency of new technology by constructing and comparing profile matrices for a technology field at different times

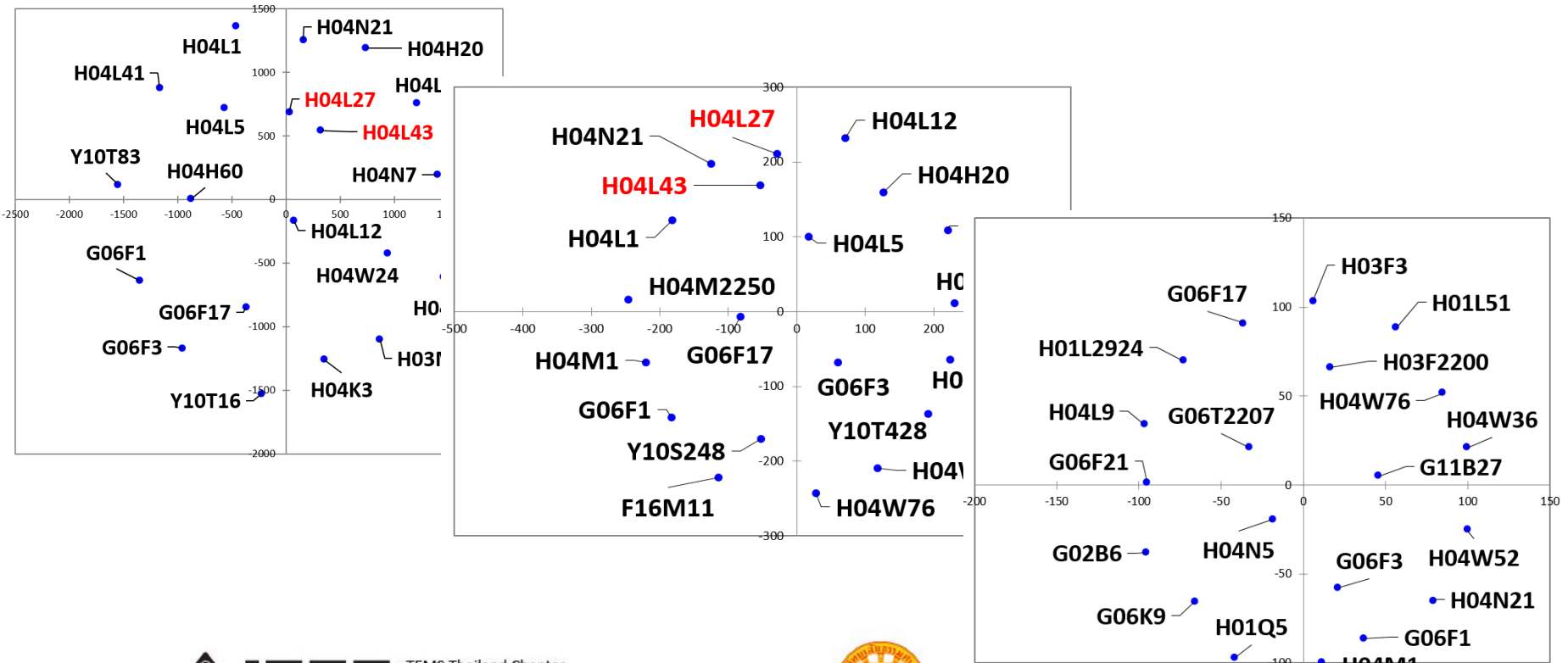
# A Case Study (1)

- A well-know, Taiwan-based smart phone manufacturer, HTC Corporation



# A Case Study (2)

- Multidimensional scaling (MDS) applied to the HTC profile matrices at 2012, 2014, 2016



# Issues of 2D Profiling

- Most patents have just a single classification symbol?
- A patent's technology content may involve the co-assignment of, not two, but three or more classification symbols?
- Some pairs of classification symbols may actually be “noises?”
- A symbol has a high individual assignment frequency, it should also have high co-assignment frequencies with other symbols?





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# Thank You