Visualizing Information Seeking With Q-analysis

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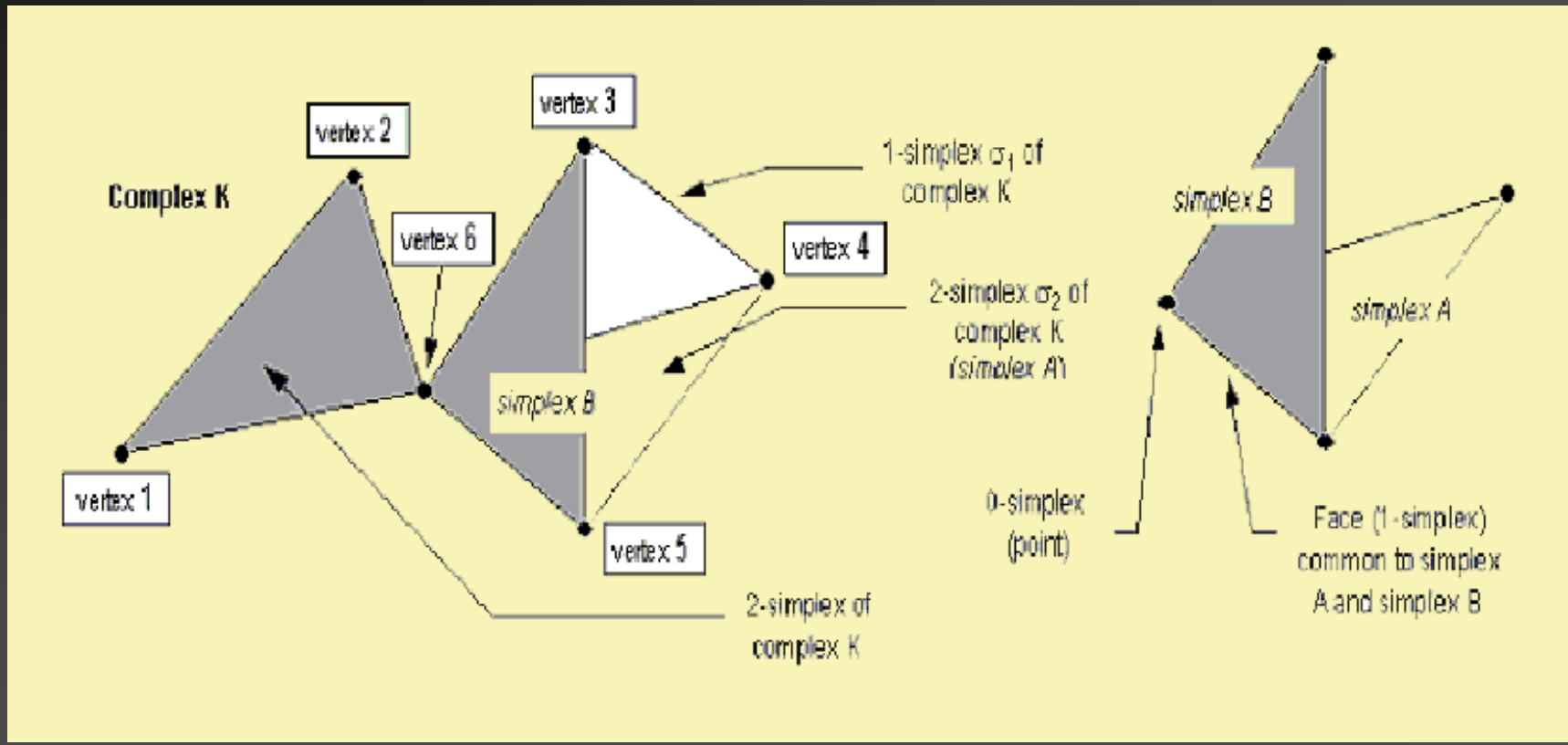
Q-analysis

- A geometrically oriented approach to exploring and representing structure in data, mapping relations among finite sets
- Draws on the topology of simplices and simplicial complexes
- Produces measures as well as graphs
- Shares characteristics of both cluster analysis and network analysis

Simplices and Simplicial Complexes



Origins

- Developed by English mathematician R. H. Atkin (Atkin, 1974).
- Used for research in psychology (Cowley, 1986) urban planning (Atkin, l975), organizational networks (Atkin, l977), mass media (Gould, Johnson and Chapman, 1984), artificial intelligence (Valencia & Giavitto, 1998).

Related Research at UB Informatics

- Jacobson, T., & Yan, W. (1998). Q-analysis Techniques for Studying Communication Content. Quality & Quantity, 32: 93-108.
- Tutzauer, F. (1994, February). Statistical distribution of Q-analytic eccentricities. Paper presented at Sunbelt 14, the annual meeting of the International Network for Social Network Analysis, New Orleans.
- Jacobson, T. L. Fusani, D. & Yan, W. (1993) Q-analysis of User Database Interaction. International Journal of Man-Machine Studies. 38, 787-803.

Example: Drug War News Coverage in New York Times

- Drug War News Classification
- Cluster Components Table
- Graph of Simplicial Complex

Drug War News Classification

#	Category Label	#	Category Label
D1	Drug Use	D29	Debate on Drug Tests
D2	Drug Possession	D30	Allocation of Anti-Drug Funding
D3	Drug Purchasing	D31	Treatment Planning
D4	Drug Trafficking	D32	Education Planning
D5	Selling Drugs	D33	Prison Expansion
D6	Drug Production	D34	Use of Military Forces
D7	Drug Profiteering	D35	Eviction of Drug-Related Tenants
D8	Threats	D36	Termination of Housing Subsidies
D9	Bombing	D37	Appointment of New Anti-Drug Leader
D10	Murder	D38	Inner City Problems
D11	Military Training/Procedures	D39	Fearlessness Against Dealers
D12	Arrests	D40	Fear of Dealers
D13	Investigation	D41	Optimismism re: Anti Drug Measures
D14	Extradition	D42	Skepticism toward Drug War
D15	Confiscation	D43	Harm to Infants of Drug Users
D16	Drug Searches	D44	Comparison With Smoking
D17	Police Raid	D45	Fighting Drugs in Neighborhoods
D18	Anti-Violence Measures	D46	Presidential Plea
D19	Jail, doing "time"		
D20	Gunfire		
D21	Indictment		
D22	Court Hearings		
D23	Trial		
D24	Conviction		
D25	Sentencing		
D26	Probation		
D27	Court Ruling		
D28	Debate on Drug Searches		

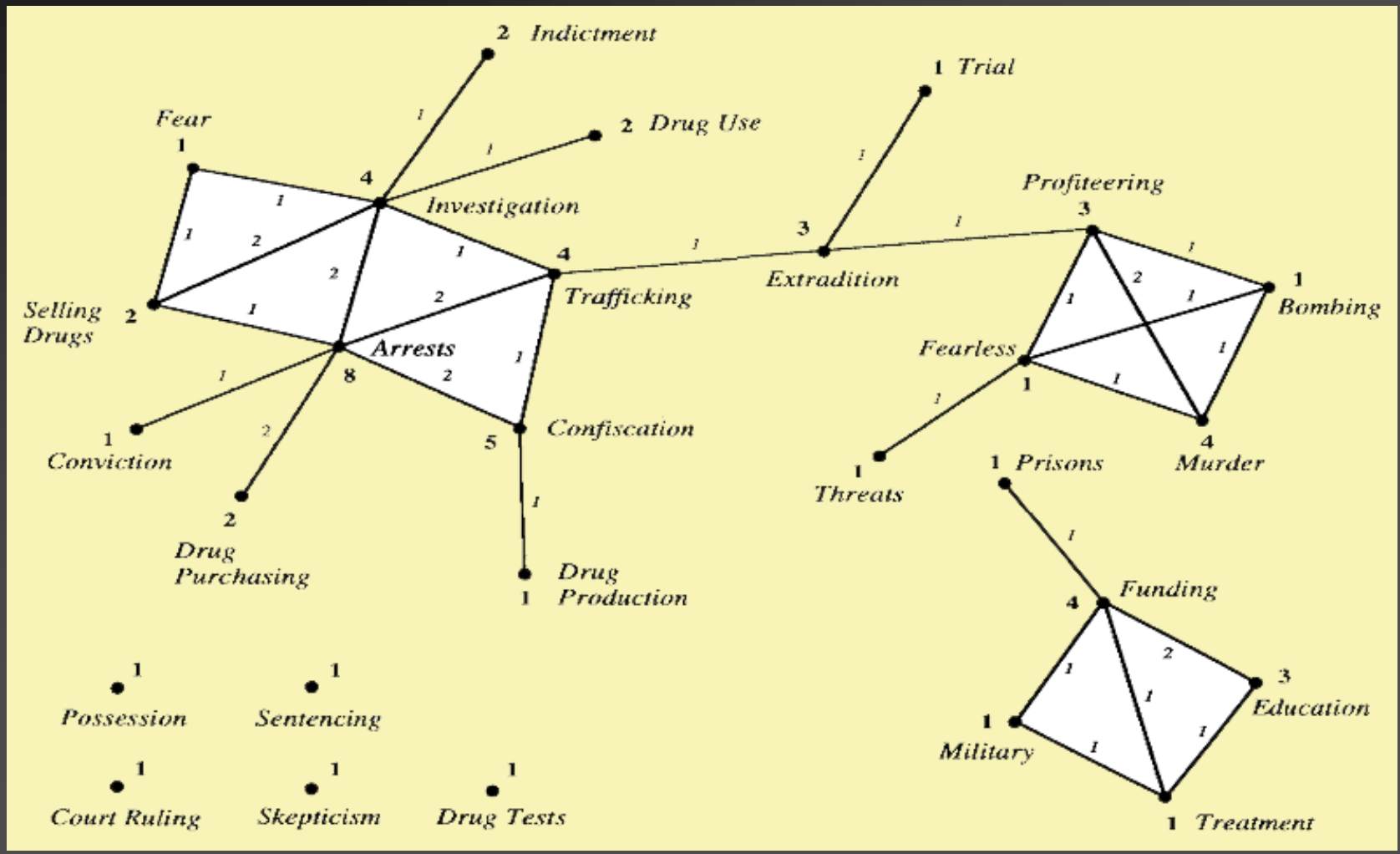
Drug War Cluster Components

q-value	Q_q-value	Components
q=8	Q_8=1	{Arrests}
q=5	Q_5=2	{Confiscation}, {Arrests}
q=4	Q_4=6	{Drug Trafficking}, {Murder}, {Investigation}, {Allocation of Anti-Drug Funding}, {Confiscation}, {Arrests}
q=3	Q_3=9	{Threats}, {Extradition}, {Education Planning}, {Drug Trafficking}, {Murder}, {Investigation}, {Allocation of Anti-Drug Funding}, {Confiscation}, {Arrests}
q=2	Q_2=7	{Drug Use}, {Indictment}, {Extradition}, {Murder, Threats}, {Allocation of Anti-Drug Funding, Education Planning}, {Drug Purchasing, Drug Trafficking, Selling Drugs, Arrests, Investigation, Confiscation}
q=1	Q_1=7	{Drug Possession}, {Sentencing}, {Court Ruling}, {Debate on Drug Tests}, {Skepticism} {Allocation of Anti-Drug Funding, Treatment Planning, Education Planning, Prison Expansion, Use of Military Forces}, {Drug Use, Buying Drugs, Drug Trafficking, Selling Drugs, Producing Drugs, Drug Profiteering, Threats, Bombing, Murder, Arrests, Investigation, Extradition, Confiscation, Indictment, Trial, Conviction, Fearlessness, Fear}
q=0	Q_0=1	{All}

Drug War Simplicial Complex:

27 Individual Stories (Simplices)

Have Shared/Overlapping Content



Example: Sense-Making During User Database Interaction

- Information Seeking Classification
- Graph of One Individual Session
- Graph of Full Simplicial Complex

Timeline for a Single Respondent: Events with Questions

Event 1: Usually I can read the functions, but I couldn't understand the first screen at first, but then I remembered.

Event 2: I chose "currnt" but I typed in the entire line. It didn't work.

Question: Why wasn't the system taking the file?

Event 3: I finally tried just "currnt" and it worked.

Event 4: I typed my string and it told me certain words were unacceptable, but it was searching anyway.

Question: Why wasn't it accepting these simple words, like "there," "what" and "why?"

Event 5: I revised my original question and I got one story. It was very relevant.

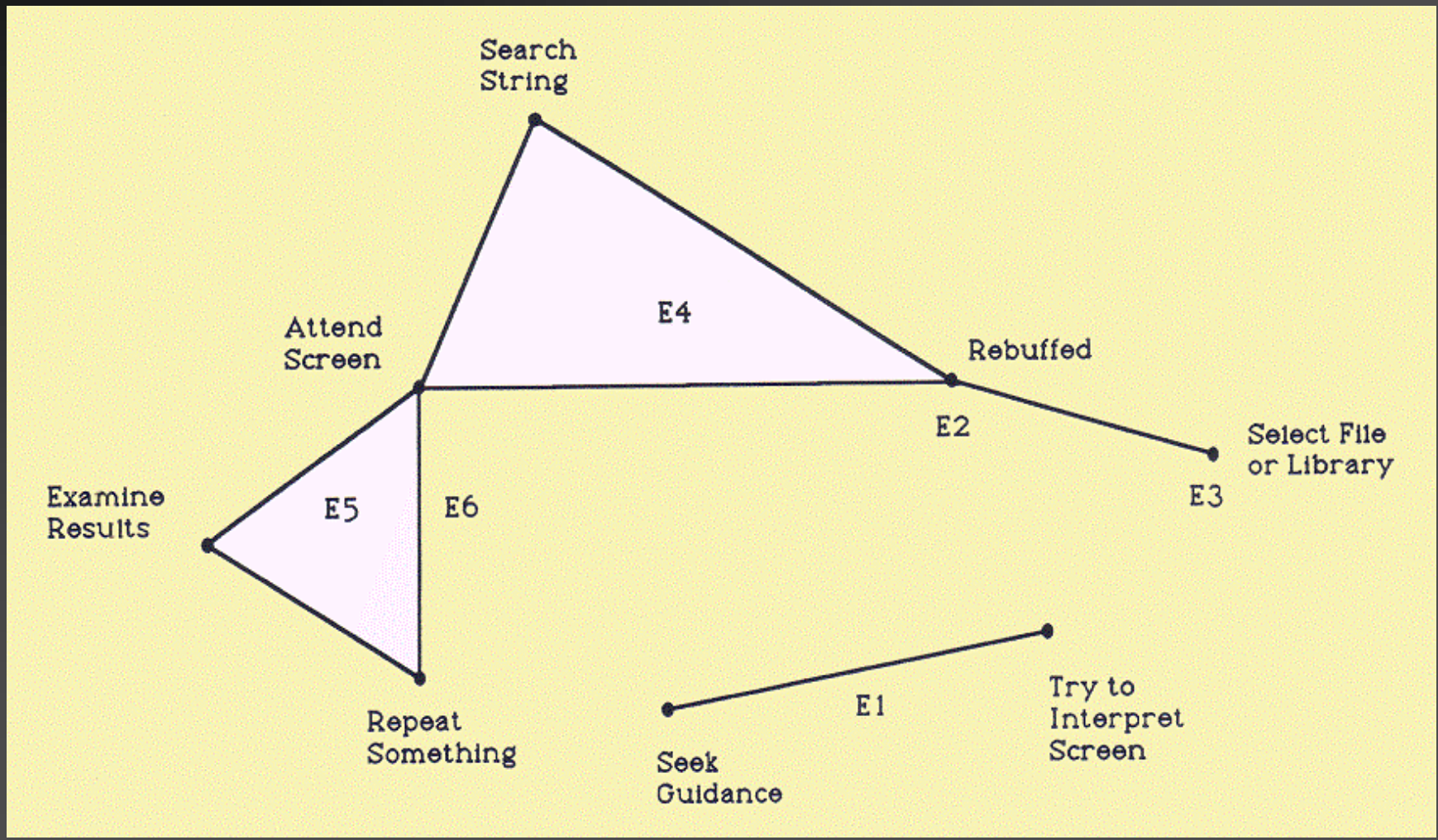
Question: Why [was] only one story [retrieved] with such a large string?

Event 6: I typed over the original search and I got 9 stories.

Descriptive Classification Scheme

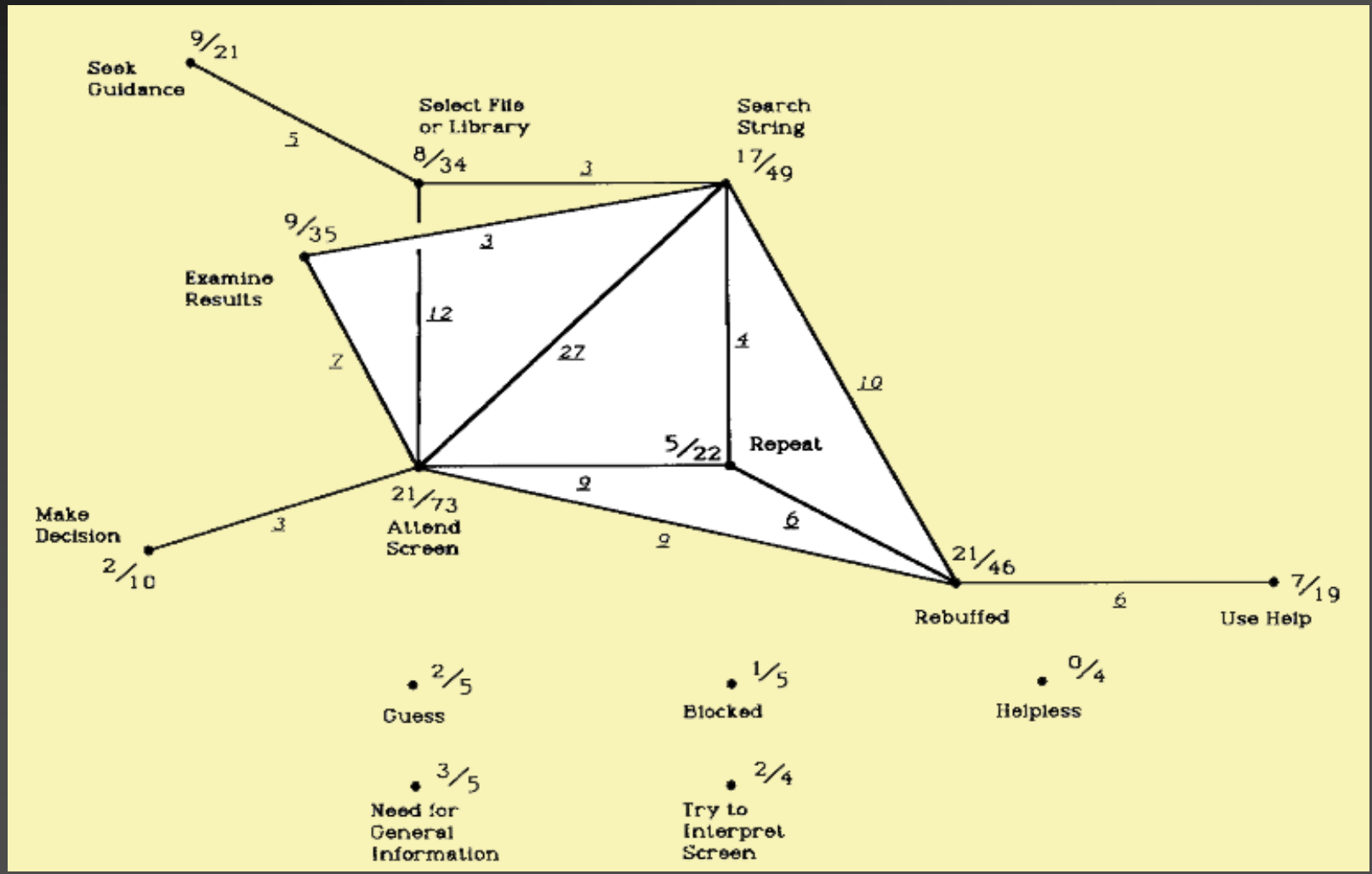
Category Label	Category Description
Select	Selecting Library or File(s)
String	Designing, Modifying and/or Using String(s)
Results	Examining or Evaluating Results
Decide	Making Decisions or Being Forced to Do So
Guess	Guessing
Attend	Attending Screen, Receiving System Response
Guidance	Looking for Guidance on Screen
Interpret	Difficulty Interpreting Screen Message(s)
Blocked	Blocked or unable to accomplish something
Rebuffed	Unsatisfactory result or error message
Repeat	Repeating Something
Help	Using System Help Feature
Specific Knowledge	Not Knowing Something Specific
General Knowledge	Not Knowing Generally What To Do
System	Evaluating System
Self	Evaluating Self
Express	Expressing Helplessness
Question	Question Was Asked
Answer	Question Was Answered

Single Respondent's Event Backcloth



User System Interaction Complex:

User Group Actions Reveal Structure in Database Use Behavior



Advantages & Problems

Descriptively Rich

Can Include Context and Seeking Behavior

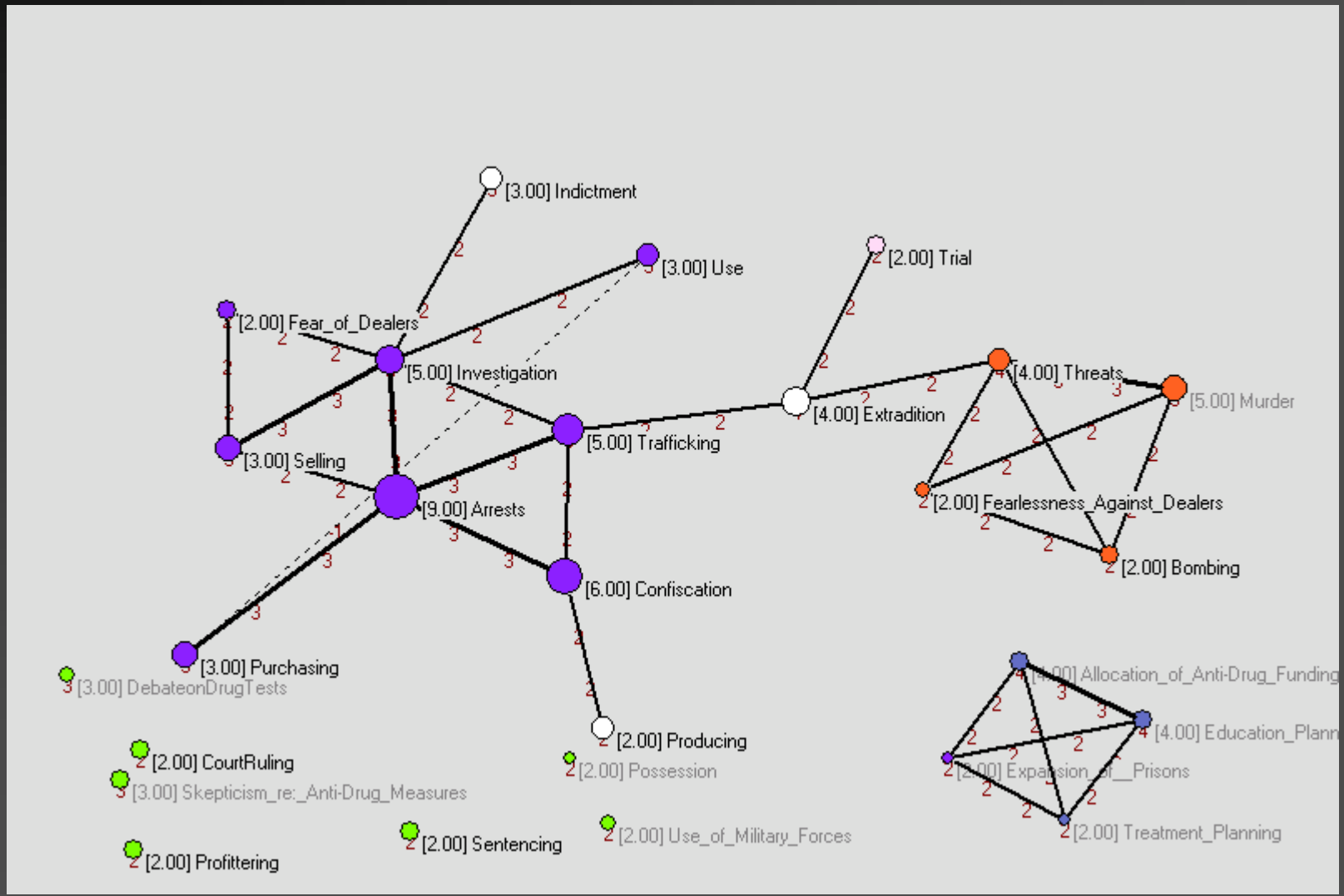
Laborious (but Pajek)

Quantifying is Somewhat Difficult

Next Step

Automate Based on Pajek

Pajek Drug War Data Graph



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