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MCDA Software Overview & Practice

It helps if you download and install IDS (Intelligent Decision System) before attending this session from (Installation key: IDS-XY3-1000000):
http://php.portals.mbs.ac.uk/Portals/49/docs/IDS50StudentVersion_000.rar
 Operations manual of IDS is available from your installation folder

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Outline

- 1. MCDA Software brief overview :
 - IDS
 - Web Hipre
 - HiView
 - Expert Choices
 - Logical Decisions
- 3. Applications of IDS
- 2. Demonstration and practice of IDS (Intelligent Decision System)

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Some MCDA Software Tools in Value Function School

Selected from a Decision Analysis Software Survey*

- IDS – ER http://php.portals.mbs.ac.uk/Portals/49/docs/IDS50StudentVersion_000.rar
- ExpertChoice - AHP <http://www.expertchoice.com/>
- HiView – Additive Value Function <http://www.catalyze.co.uk/?id=231>
- Web Hipre – AHP and Additive Value Function <http://www.hipre.hut.fi/>
- Logical Decisions - Additive Utility Function <http://www.logicaldecisions.com/>

* The latest biannual decision analysis software survey report:
<http://www.lionhrtpub.com/orms/surveys/das/das.html>

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Features of IDS

- Accept **different data formats**
 - Data with **missing information**
 - **Random variables**
 - Different assessment **grades or scales**
- Requirements
 More relaxed requirements (no need to satisfy preferential independence), only utility/value independence

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Features of IDS

- Data input
 - In ER Framework: Belief Decision Matrix
 - Allow random data, missing data, partially uncertain data
- Aggregation: Evidential Reasoning Approach
- Sensitivity Analysis: with Graphical Interfaces
- Automated Assessment Report in Text

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Example for Hands-on Practice: Which house to buy?

(E - Excellent, G - Good, A - Average, I - Indifferent, P - Poor)

Attribute (weight)	Range	Altrincham	Heaton Moor	Heaton Mercy	Didsbury
Location (10)	P - E	{{(G, 0.5), (E, 0.5)}	{{(G, 0.5)}	{{(A, 0.2), (G, 0.8)}	{{(E, 1.0)}
Distance to office, miles (1)	1-15 miles	7	5	6	5.5
Price, pounds (5)	£250k-£400k	285	275	295	375
Attractiveness (6)	P - E	{{(P, 0.05), (G, 0.35), (E, 0.60)}	{{(A, 0.4), (E, 0.6)}	{{(G, 0.3), (E, 0.7)}	{{(G, 0.6), (E, 0.4)}

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Example 2 for practice: Motor Cycle Selection

T. Isitt, 1990, "The Sports Tourers", Motor Cycle International, No.64, September, p18-2

Attribute (weight)	Range	Kawasaki	Yamaha	Honda	BMW	
Price, pounds (100)	£9000-£5000	6499	5199	6199	8220	
Displacement (50)	900cc-1200cc	1052	1188	998	987	
Range, miles (70)	150-200 miles	175	160	170	200	
Top speed, mph (70)	140-165 mph	160	155	160	145	
Engine (150)	Responsiveness (30)	P - E {{(G, 0.2), (E, 0.8)}	{{(G, 0.4), (E, 0.6)}	{{(G, 1.0)}	{{(I, 1.0)}	
	Fuel consumption in mpg (60)	25-30 mpg {{(38, 1)}	{{(34, 1)}	{{(37, 1)}	{{(42, 1)}	
	Quietness (15)	P - E {{(I, 0.5), (A, 0.5)}	{{(A, 1.0)}	{{(G, 0.5), (E, 0.5)}	{{(A, 1.0)}	
	Vibration (15)	P - E {{(G, 1.0)}	{{(I, 1.0)}	{{(G, 0.5), (E, 0.5)}	{{(P, 1.0)}	
Operation (77)	Starting (30)	P - E {{(G, 1.0)}	{{(A, 0.6), (G, 0.4)}	{{(G, 1.0)}	{{(A, 1.0)}	
	Handling (35)	Steering (10)	P - E {{(E, 1)}	{{(G, 1.0)}	{{(A, 1.0)}	{{(A, 1)}
		Bumpy bends (3)	P - E {{(A, 0.5), (G, 0.5)}	{{(G, 1.0)}	{{(G, 0.9), (E, 0.1)}	{{(P, 0.5), (I, 0.5)}
	Manoeuvrability (12)	P - E {{(A, 1.0)}	{{(E, 0.1)}	{{(A, 1.0)}	{{(P, 1.0)}	
	Transmission (14)	Top speed stability (10)	P - E {{(E, 1.0)}	{{(G, 1.0)}	{{(G, 1.0)}	{{(G, 0.6), (E, 0.4)}
Clutch operation (7)		P - E {{(A, 1)}	{{(G, 1.0)}	{{(E, 1)}	{{(I, 0.2), (A, 0.8)}	
Gearbox operation (7)		P - E {{(A, 0.5), (G, 0.5)}	{{(I, 0.5), (A, 0.5)}	{{(E, 1.0)}	{{(P, 1.0)}	
Brakes (28)	Stopping power (12)	P - E {{(G, 1.0)}	{{(A, 0.4), (G, 0.6)}	{{(G, 1.0)}	{{(A, 1)}	
	Braking stability (8)	P - E {{(G, 0.5), (E, 0.5)}	{{(G, 1.0)}	{{(A, 0.5), (G, 0.5)}	{{(E, 1.0)}	
	Feel at control (8)	P - E {{(P, 1.0)}	{{(G, 0.5), (E, 0.5)}	{{(G, 1.0)}	{{(G, 0.5), (E, 0.5)}	
General (150)	Quality of finish (60)	P - E {{(P, 0.5), (I, 0.5)}	{{(G, 1.0)}	{{(E, 1.0)}	{{(G, 0.5), (E, 0.5)}	
	Seat comfort (45)	P - E {{(G, 1.0)}	{{(G, 0.5), (E, 0.5)}	{{(G, 1.0)}	{{(E, 1.0)}	
	Headlight (15)	P - E {{(G, 1.0)}	{{(A, 1.0)}	{{(E, 1.0)}	{{(G, 0.5), (E, 0.5)}	
	Mirrors (15)	P - E {{(A, 0.5), (G, 0.5)}	{{(G, 0.5), (E, 0.5)}	{{(E, 1.0)}	{{(G, 1.0)}	
Horn (15)	P - E {{(A, 1)}	{{(G, 1.0)}	{{(G, 0.5), (E, 0.5)}	{{(E, 1.0)}		

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Reading List

- IDS Operations Manual, in IDS installation directory
- S. French and D. L. Xu (2005), "Comparison study of multi-attribute decision analysis tools", Journal of Multi-Criteria Decision Analysis, Vol.13, No.2-3, pp. 65-80.
- D. L. Xu, G. McCarthy and J. B. Yang, "[Intelligent decision system and its application in business innovation self assessment](#)", Decision Support Systems, Vol.42, pp.664-673, 2006.
- J. B. Yang and D. L. Xu, "[On the evidential reasoning algorithm for multiattribute decision analysis under uncertainty](#)", IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans, Vol.32, No.3, pp.289-304, 2002.

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