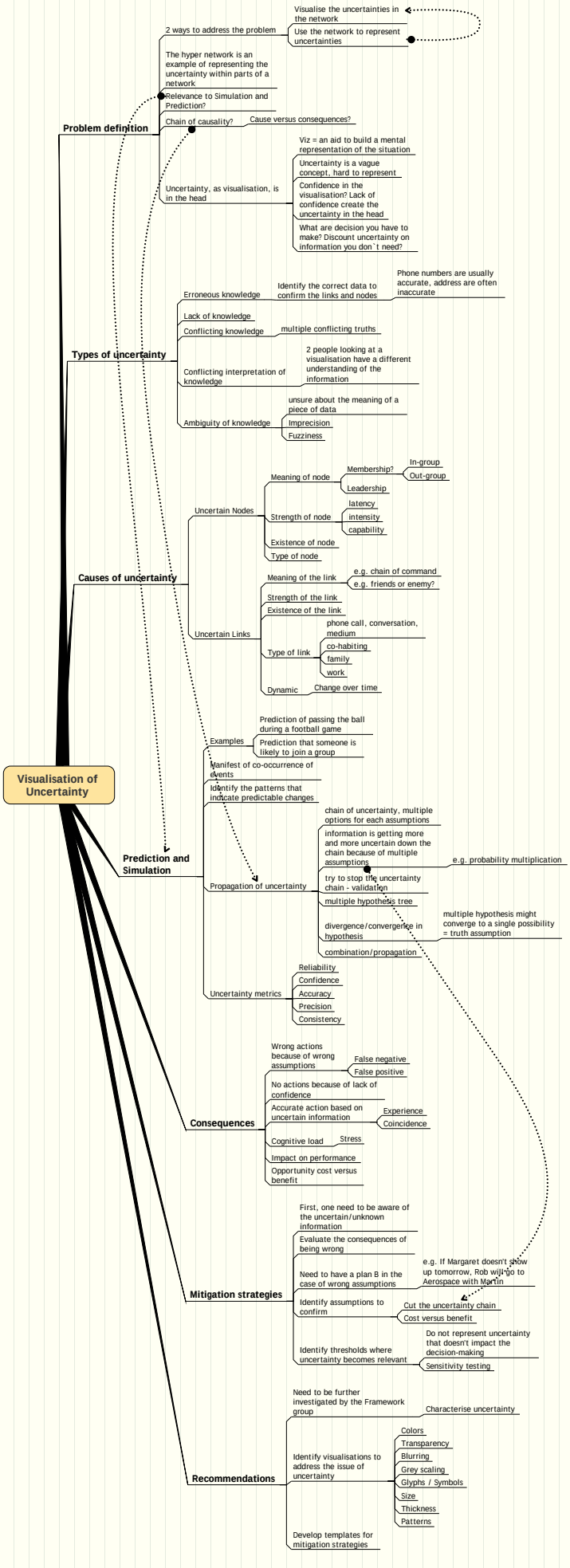
Visualisation of Uncertainty
Problem definition
2 ways to address the problem
Visualise the uncertainties in the network
Use the network to represent uncertainties
The hyper network is an example of representing the uncertainty within parts of a network
Relevance to Simulation and Prediction?
Chain of causality?
Cause versus consequences?
Uncertainty, as visualisation, is in the head
Viz = an aid to build a mental representation of the situation
Uncertainty is a vague concept, hard to represent
Confidence in the visualisation? Lack of confidence create the uncertainty in the head
What are decision you have to make? Discount uncertainty on information you don´t need?
Types of uncertainty
Erroneous knowledge
Identify the correct data to confirm the links and nodes
Phone numbers are usually accurate, address are often inaccurate
Lack of knowledge
Conflicting knowledge
multiple conflicting truths
Conflicting interpretation of knowledge
2 people looking at a visualisation have a different understanding of the information
Ambiguity of knowledge
unsure about the meaning of a piece of data
Imprecision
Fuzziness
Causes of uncertainty
Uncertain Nodes
Meaning of node
Membership?
In-group
Out-group
Leadership
Strength of node
latency
intensity
capability
Existence of node
Type of node
Uncertain Links
Meaning of the link
e.g. chain of command
e.g. friends or enemy?
Strength of the link
Existence of the link
Type of link
phone call, conversation, medium
co-habiting
family
work
Dynamic
Change over time
Prediction and Simulation
Examples
Prediction of passing the ball during a football game
Prediction that someone is likely to join a group
Manifest of co-occurrence of events
Identify the patterns that indicate predictable changes
Propagation of uncertainty
chain of uncertainty, multiple options for each assumptions
information is getting more and more uncertain down the chain because of multiple assumptions
e.g. probability multiplication
try to stop the uncertainty chain - validation
multiple hypothesis tree
divergence/convergence in hypothesis
multiple hypothesis might converge to a single possibility = truth assumption
combination/propagation
Uncertainty metrics
Reliability
Confidence
Accuracy
Precision
Consistency
Consequences
Wrong actions because of wrong assumptions
False negative
False positive
No actions because of lack of confidence
Accurate action based on uncertain information
Experience
Coincidence
Cognitive load
Stress
Impact on performance
Opportunity cost versus benefit
Mitigation strategies
First, one need to be aware of the uncertain/unknown information
Evaluate the consequences of being wrong
Need to have a plan B in the case of wrong assumptions
e.g. If Margaret doesn't show up tomorrow, Rob will go to Aerospace with Martin
Identify assumptions to confirm
Cut the uncertainty chain
Cost versus benefit
Identify thresholds where uncertainty becomes relevant
Do not represent uncertainty that doesn't impact the decision-making
Sensitivity testing
Recommendations
Need to be further investigated by the Framework group
Characterise uncertainty
Identify visualisations to address the issue of uncertainty
Colors
Transparency
Blurring
Grey scaling
Glyphs / Symbols
Size
Thickness
Patterns
Develop templates for mitigation strategies