Decisions under uncertainty

A likelihood approach

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Structur of decision problems

A decision problem is given by the tripel $(\mathcal{D})$

- Set $\mathcal{D}$ with $d \in \mathcal{D}$ denotes our *decisions* or *actions*
- Set Θ with $\vartheta \in \Theta$ denotes our *enviromental conditions* or *parameters*

Types of uncertainty

Generation of environmental conditions $\theta \in \Theta$
We distinguishing between type I and type II

- Type I: perfect random mechanism
- Type II: Gegenspieler

Mathematics

Theorem (Fermat's little theorem)

For a prime p and $a \in \mathbb{Z}$ it holds that $a^p \equiv a$ (mod p).

Proof.

The invertible elements in a field form a group under multiplication. In particular, the elements

$$1, 2, \ldots, p - 1 \in \mathbb{Z}_p$$

form a group under multiplication modulo p. This is a group of order $p - 1$. For $a \in \mathbb{Z}_p$ and $a \neq 0$ we thus get $a^{p-1} = 1 \in \mathbb{Z}_p$. The claim follows. ∎

Mathematics

Example

The function $\varphi \colon \mathbb{R} \to \mathbb{R}$ given by $\varphi(x) = 2x$ is continuous at the point $x = \alpha$, because if $\epsilon > 0$ and $x \in \mathbb{R}$ is such that $|x - \alpha| < \delta = \frac{\epsilon}{2}$, then

$$|\varphi(x) - \varphi(\alpha)| = 2|x - \alpha| < 2\delta = \epsilon.$$

Highlighting

Highlighting

Some times it is useful to highlight certain words in the text.

Important message

If a lot of text should be highlighted, it is a good idea to put it in a box.

It is easy to match the colour theme.

Lists

- Bullet lists are marked with a grey box.

1. Numbered lists are marked with a white number inside a grey box.

Description highlights important words with grey text.

Items in numbered lists like 1 can be referenced with a grey box.

Example

- Lists change colour after the environment.

Effects

1 Effects that control

Use textblock for arbitrary
placement of objects.

Effects

1 Effects that control
2 when text is displayed

Use **textblock** for arbitrary placement of objects.

Theorem

This theorem is only visible on slide number 2.

Effects

1. Effects that control
2. when text is displayed
3. are specified with <> and a list of slides.

Use **textblock** for arbitrary placement of objects.

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Use **textblock** for arbitrary placement of objects.

It creates a box with the specified width (here in a percentage of the slide's width) and upper left corner at the specified coordinate (x, y) (here x is a percentage of width and y a percentage of height).

References I

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References II

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