

MIT-3070 Mittausinformaatiojärjestelmän suunnittelu, 7 op

Tentti 13.12.2010. Yhteensä max 15 pistettä. Harjoitustyöstä max 15 pistettä.

OSA I. Seuraavassa on viisi väittämää. Vastaa kunkin väittämän kohdalla, onko se tosi vai epätosi. Perustele lyhyesti vastauksesi. [Oikeasta tosi/epätosi –vaihtoehdosta 0,5 pistettä ja järkevästä perustelusta, väärällekin vastaukselle, 0,5 pistettä; koko osasta yhteensä korkeintaan 5 pistettä]

1. Operatiivisella päätöksenteolla on lähes aina objektiivinen organisaation asettama tavoite, jota tukemaan mittausinformaatiojärjestelmä tuottaa tietoa.
2. Käyttäjävaatimukset kuvaavat käyttäjän toivomat järjestelmän input-output toiminnallisuudet.
3. Dynaamista järjestelmää koskeva päätöksenteko on herkkää optimoinnin aikahorisontin valinnan suhteen.
4. On suositeltavaa iteroida toteutusmäärittelyjä (detailed design specifications) ja toiminnallisuusmäärittelyjä (functional specifications) useaan otteeseen.
5. Riskipremio hinnoittelee epävarmuuden aiheuttaman riskin suhteessa odotusarvoiseen kustannukseen.

OSA II. Oheismateriaalissa on joukko yleispäteviä päätöksenteon tukijärjestelmän käyttäjävaatimuksia tapauksessa, jossa päätöksentekotehtävä on rakenteistettu stokastiseksi optimointitehtäväksi. Käyttäjä voi tutkia ehdotetun päätöksen perusteita, mutta hänellä ei ole valtuuksia muuttaa päätöksentekotehtävän rakennetta.

- a) Arvioi käyttäjävaatimusten esitystapa (template): mikä on kunkin osion rooli ja kuka määrittelee kenelle? (max 2 pistettä)
- b) Tämä vaatimusten ryhmä olettaa, että päätöksentekotehtävä on jo valmiiksi rakenteistettu (ja konfiguroitu järjestelmään) stokastiseksi optimointitehtäväksi. Mitä käyttäjävaatimuksia rakenteistamistehtävästä seuraa? (max 3 pistettä)
- c) Tehtävänä on laatia mittaustietoon perustuva päätöksenteon tukijärjestelmä liikenteen ohjaamiseksi ruuhkahuippujen aikana liikennevalojen avulla ja mitattujen liikennemäärien perusteella. Pohdi, miten oheismateriaalin käyttäjävaatimukset soveltuvat tähän ja mitä vaatimukset voisivat konkreettisesti tarkoittaa. (max 5 pistettä)

[Osasta II korkeintaan 10 pistettä. Osa II on aineistotehtävä eikä siihen siten ole yhtä oikeaa vastausta, vaan sen avulla testataan tenttijän kykyä hahmottaa kokonaisuuksia ja soveltaa tässä hahmotuksessaan kurssilla esiteltyjä käsitteitä ja ajatusmalleja.]

1.1 Generating and justifying decision proposals

GUR-1.1.1a	Generate basis for critical evaluation of system state
Required by/for:	Operators, shift foremen
Description:	The DSS generates a scenario of system state according to actor's profile in decision making
Initial state:	The DSS notices that an actor with known profile has entered to use the system.
Final state:	The DSS has generated the scenario.

GUR-1.1.1	Notify the user about a need to make a decision and act
Required by/for:	Operators, shift foremen
Description:	Based on the measurements and models available, the DSS notices a situation that needs a decision to be made and brings this need to the user's attention.
Initial state:	The DSS analyzes the condition of the process and has noticed a situation where a decision needs to be made.
Final state:	The DSS has created a notification that the task of making a decision is active.

GUR-1.1.2	Generate a proposal for a decision
Required by/for:	Operators, shift foremen
Description:	<p>Using data and models available, and by solving an optimization task (single goal, possibly stochastic but with a defined attitude towards risk) a proposal is generated and presented to the user without any additional information</p> <p>This is intended to support routine decisions and/or to serve as a starting point for a dialogue between system and user through which the decision is verified or modified.</p> <p>Applicable only to decision situations that have been fully structured.</p>
Initial state:	1) The user recognizes that the task of making a decision is active, or 2) the system notifies the user that the task of making a decision is active (time based). The DSS has continuous access to the data relevant to decision making and it has been configured to solve the optimization problem derived from the decision task.
Final state:	The user acknowledges to have received the advice from the system and the user proceeds on the basis of his orders and judgment.

GUR-1.1.3	Present the conceptualization of system state, consequences and description of decision alternatives
Required by/for:	Shift foremen, operations' managers
Description:	Based on the measurements, system state descriptions and event

	history, the current system state is described with given concept system and all potential decision alternatives are presented in an understandable and acceptable form, and on request the consequences of user selected decision alternatives are presented (on alternative-by-alternative basis)
Initial state:	The user has received the proposal for a decision or has generated a decision candidate through other means and has recognized a need for more information before committing to a decision.
Final state:	The user is aware of system state, decision alternatives and their consequences.

GUR-1.1.4	Present measurement information relevant for decision to be made
Required by/for:	Operators, shift foremen
Description:	The measurement data utilized in generating the decision proposal or elected by the user is presented; using available and suitable methods the uncertainty and reliability of the data is assessed and presented in an understandable and acceptable form.
Initial state:	The user has received the proposal for a decision without knowing anything about the relevance and reliability of the data being available.
Final state:	The user has received the data utilized in the generation of decision proposal or required when analyzing a decision candidate generated by the user, with assessed uncertainty and reliability.

GUR-1.1.5	Present the relevant state estimation and prediction models, their estimation and prediction results and uncertainties in them
Required by/for:	Operators, shift foremen, operations' managers
Description:	Concerning the current decision proposal or user specified decision candidate, the relevant state estimation and prediction models are selected and visualized, and the produced estimation and prediction results with uncertainties are presented in an understandable and acceptable form.
Initial state:	The user has received a decision proposal or has generated a decision candidate through other means and has been informed about the estimated system state and decision alternatives without any information about the relevant estimation and prediction models or their results or related uncertainties.
Final state:	The user has received the state estimation and prediction models and results with uncertainties assessed.

GUR-1.1.6	Present the relevant objective(s) and the decision time horizon
Required by/for:	Operators, shift foremen
Description:	The objectives used in the generation of decision proposal or user specified decision candidate, possibly by using a number of

	optimization time horizons, are presented to the user in an understandable and acceptable form. This helps the user to realize whether the system is doing what it is supposed to do or not.
Initial state:	The user has received a decision proposal or has generated a decision candidate through other means and has been informed about the measurements, process state and decision alternatives including the relevant estimation and prediction results and uncertainties in them.
Final state:	The user has acknowledged that he has been informed about the relevant objectives for process operation in different time horizons.

GUR-1.1.7a	Present the degree of satisfaction of different objectives in multi-goal decision making
Required by/for:	Operator, shift foremen, operations' managers
Description:	Given a decision proposal or user specified decision candidate the values of objectives and the level of satisfaction is presented to the user in an understandable and acceptable form. Also the measurement principle of the objective satisfaction is presented for the users. The motivation of the measurement principle is derived from the higher level objectives of the company.
Initial state:	The user has received a decision proposal or has generated a decision candidate through other means and has been informed about the measurements, process state and decision alternatives including the relevant estimation and prediction results and uncertainties in them
Final state:	The user has acknowledged that he has been informed about the satisfaction level of the multiple objectives related to the decision making task.

GUR-1.1.7b	Present trade-off possibilities in multi-goal optimization
Required by/for:	Operator, shift foremen, operations' managers
Description:	The trade-off ratios between the decision objectives are presented for the users in an understandable and acceptable form. One or several of the objectives may describe the attitude towards risk. The favored trade-off is motivated.
Initial state:	The user has received a decision proposal or has generated a decision candidate through other means and has been informed about the measurements, process state and decision alternatives including the relevant estimation and prediction results and uncertainties in them.
Final state:	The user understands how much a certain objective can be improved by letting a set of other objectives become worse by an user specified amount.

GUR-1.1.8	Show the robustness of proposed decision to user selected model parameters
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Required by/for:	Shift foremen, operations' managers
Description:	Concerning the system state and prediction models used in generating the decision proposal, the sensitivity of this proposal is analyzed with respect to variations in parameters selected by the user. The sensitivity is visualized and presented in an understandable and acceptable form.
Initial state:	Having the proposed decision as well as the used system state and prediction models available, the user selects the parameters with respect to which the sensitivity will be analyzed.
Final state:	The sensitivity analysis has been done and the user has received the results of the sensitivity analysis of the proposed decision.

GUR-1.1.9	Analyze the robustness of proposed decision towards variations in user selected model structures
Required by/for:	Operations' managers
Description:	Concerning the system state and prediction models available in generating the decision proposal, the robustness of this proposal is analyzed towards variations in model structures selected by the user. The results of the robustness analysis are presented in an understandable and acceptable form.
Initial state:	Having the proposed decision and all system state and prediction models available, the user selects the model structures and their variations to be analyzed.
Final state:	The user has received the results of the robustness analysis of proposed decision.