Verification of the Bean Irrigation Expert System

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TR/CLAES/206/2001.3

1. Introduction

This verification report based on the implementation code and the following technical reports:

1. Amendment Design of Generic Bean Irrigation (TR/CLAES/190/2001.1).
2. Implementation Generic Bean Irrigation (TR/CLAES/197/2001.2).

The activities used to produce this report are as follows:
1. Walking through the design report.
2. Walking through both the design report and implementation report then documenting the differences between them.
3. Walking through both the implementation report and source code then documenting the differences between them.
4. Summarize the result of testing usability of the system.
5. Conclusion.

2. Requirement Specification Report Versus Design Report

- There is no Requirement Specification Report.

3. Design Walkthrough

3.1 Domain Knowledge

- In the plantation factors ontology, the following concepts use the functions that are deleted as mentioned in the amendement report of bean:

Concept	Deleted function
Long_basis	Long_bases_f
With_basis	With_basis_f

- In the plantation factors ontology, at the amendement report at page 6 it is mentioned that the relation (variety_characteristic_basis_r) has been updated, but the updated relation is not found in the page 7 at the amendement report.

- In the Et0 ontology, the following concepts use the relations or functions that are deleted as mentioned in the amendement report of bean:

Concept	Deleted function	Deleted relation
Et0_pen_n	-	Et0_pen_n_pcf
With_basis	-	With_basis_f
H_rh_c	H_rh_c_f	-

- In the Pawc ontology, the following functions are updated in the amendement of the bean but it is not found firstly in the design and it is not added in the mentioned of tomato:

Function
Rd_f
Ad_f

- In the Pawc ontology, the following concepts use the relations or functions or tables that are not found in the design and are not mentioned in the amendement report of bean:

Concept	Function	Relation	Table
Unit_factor	-	Unit_factor_r	-
Rd_f1	-	-	Rd_f1
Rd_f2	-	-	Rd_f2
Rd_r	Rd_r_f	-	-
Ad_f1	-	-	Ad_f1
Ad_f2	-	-	Ad_f2
Ad_r	Ad_r_f	-	

- In the Interval ontology, the following concepts use the relation that are deleted as mentioned in the amendement report of bean:

Concept	Deleted relation
Irrigation_based_on_eta	Irrigation_based_on_eta_pcf

3.2 Inference Knowledge

- There is no difference.

3.3 Task Knowledge

- The procedure (initialization_last_irrigation) is found in the procedure task irrigation schedule but is not found in the task structure .

4. Design Report Versus Implementation Report

4-1- Domain Knowledge

DOMAIN ONTOLOGY

- In the plantation ontology The following properties have different tables in the source of value between the design and implemetation:

Concept	Property
Climate	Ra_par_a
	Ra_par_b
	Msh_par_a
	Msh_par_b

- In the plantation ontology, the following properties have functions as the source of values but these functions were deleted in the bean amendment:

Concept	Property	Function
Plant	Init_ve_stage	Init_ve_stage_f
	Init_ve_fl_stage	Init_ve_fl_stage_f

- In the plantation ontology, the following properties are found in the implementation report but are not found in the design:

Concept	Property
Current_plantation	Optimal_no_plant

- In the plantation ontology, the following properties have different lower limit in the design from the implementation:

Concept	Property	LL in the design	LL in the implementation
Farm	area	1	0

- In the operations ontology, the following properties have legal values in the design but are not found in the implementation, and are not mentioned in the amendement of the bean:

Concept	Property	Legal values
Irrigation	Schedule_type	daily

- In the plantation factors ontology, the following concepts are not found in the implementation report but are found in the design report and are not deleted in the amendement of bean:

Concept
Long_basis
Width_basis
Width_long_basis
Normal_dimension
Variety_factor
Variety_characteristic_basis
Variety_name_basis
Efy
Average_efy
Evaluation_absent

- In the operations ontology, the following concepts are found in the implementation but are not found in the design and are not added in the amendement of the bean:

Concept
Task_parameters
Initial_irrigation_schedule
Irrigation_schedule
Irr_db
Verify_plantation

- The following properties are found in the design but are not found in the implementation, and it is not menetioned in the amendement of the bean:

Ontology	Concept	Property
Et0	Et0	Visited
Eta	Eta	Visited
Pawc	Pawc	Visited
Water_requirement	Water_requirement	Visited
Irrigation_units_concepts	Irrigation_units	Value and value_n

- The following properties have diffrence in the design and implementation for the source value, and it is not mentioned in the amendement of the bean:

Ontology	Concept	Property	In the design	In the implementation
Et0	Et0	value	Derived	User
Interval	Interval	value	Derived	User

- In the Et0 ontology, the following concepts are found in the design but are not found in the implementation, and it is not mentioned in the amendement of the bean:

Concept
Control_f
Et0_pen_n
Et0_pen_c

- In the Pawc ontology, the following concepts has diffrence in the source of value at that found in the implementation from that is found in design and amendement:

Concept	Source of value
Ad_f1	Table(ad_f1_t)
Ad_f2	Table (Ad_f2_t)

- In the Pawc ontology, the following concepts are found in the design or amendement but are not found in the implementation report:

Concept
Rd
Unit_factor
Rd_f1
Rd_f2
Rd_r

- In the Interval ontology, the folowing properties has difference in its type at that is found in the bean amendement from that found in the implementation:

Concept	property	In amendement	Imp.
Interval_revised	Value	Nominal	real

- In the Interval ontology, the folowing concepts are found in the implementation but are not found in the bean amendement and the design:

Concept
Water_requirement_revised

- In the Water requirement ontology, the following concepts are found in the design but are not found in the implementation, and it is not mentioned in the amendement of the bean:

Concept
farm_id
function_parameter
Kc
Gc
rd_r
Rd
rd_f1
rd_f2
Vegetable
variety_factor
Efy
average_efy

Domain Model

- The following rules has difference in that is found in the implementation report from that is found in the design report:

Ontology	Relation	Page in the impl.	Rule	Part of rule
plantation	Current_plant_f	39,40	4,6	Value(vint_var1)

factors	actor_r			
plantation factors	Current_plant_factor_r	40	6	Value(vint_var1)
plantation factors	Low_tunnel_&_open_field_intensity_pcf	40	1,2	
Interval	Irrigation_based_on_eta_pcf	43	Relation is deleted from design	
Interval	Adaptive_ir_pocf	43	2	Value(vir_var)
Irrigation_units	Irrigation_type_r	44	1	(_152341=<150)but in design as >=150

- The following rules are found in the design report but not found in the implementation report:

Ontology	Relation	Rule
Plantation factors	Variety_factor_pcf	All
Et0	Et0_pen_c_pcf	All

- The following tables are found in the design report but not found in the implementation report:

Ontology	Table	In the imp.
Plantation	Ra_t	Ra_t_a , ra_t_b
Plantation	Msh_t	Msh_t_a , Msh_t_b

- The following rules are found in the implementation report but are not found in the design report:

Ontology	Relation	Rule
Pawc	Planting_method_r	All
Pawc	Variety_character_basis_r	All

- The following tables has differences at that are found in the implementation report from tha are found in the design and amendement reports:

Ontology	Table	In the imp.	In the des.
Operation	Irrigation_effici enty_t	T(sprinkler,0.75)	Not found
Plantation_facto r	Average_efy_t	T(bean,green,7.5) T(bean,dry,2.5)	Is different as it is in the amendement
Pawc	Rd_f2_t	T(sprinkler,1.1)	Not found
Pawc	Ad_f2_t	T(sprinkler,1.5)	Not found

- In the Plantation_factor the efy_t1 and efy_t2 are not found in the implementation clearly as in the tomato amendemnt.
  - The following tables are found in the implementation report but not found in the design report:

Table	Page in imp.
Variety_factor_t	48

- The following functions are found in the design report but not found in the implementation report:

Ontology	Functions
Plantation_factor	Long_with_basis_f
	Variety_name_basis_f
	Evaluation_absent_f
Pawc	Rd_init_st_d_f
	Rd_init_st_gf_f
	Rd_veg_st_d_f
	Rd_veg_st_f_f
	Rd_fl_st_d_f
	Rd_fl_st_f_f
	Rd_fr_st_f
Interval	User_suggested_interval_weekly_f
	Their_is_irrigation_today_f
	Their_is_no_irrigation_today_f
	Eta_plus_eta_acc_f

- The following functions are found in the implementation report but not found in the design report:

Functions	Page in imp
Kc_f	54

4-2- Inference Knowledge

• The following inference name has difference in that found in the imp. From that found in the design:

Inference	In the design	In the imp
Revise	Revise	Revise_irrigation_schedule

4-3- Task Knowledge

• The subtask(reset_climate_data) is found in the implementation report but is not found in the design report.

4-4- User Interface

• The Amendement of the design report does not include the interface layer.

5. Implementation Report Versus Source Code

• There is no differtence

6. Testing the usability of the system

6-1- General Test

• At (Initialization Dialogue), after pressing the button (Cancel) it give the messages to enter the sector id, goverator id, directorate id, and farm id . The button (cancel) must distroy the interface display not to proceed.

6-2- Test cases

Case 1:

• There is an difference between the implemtation and the system running at water quantity and time of irrigation in the output display:

drip irrigation

Central Lab for Agricultural Expert Systems
Irrigation Schedule
Crop: Bean

week_no	date	water_quantity m3/area-lr	interval/day	time/irr. min/area	No. of irr./day
1	1-9-2000	9.63	3	6	1
2	8-9-2000	12.90	3	8	1
3	15-9-2000	16.49	3	10	1
4	22-9-2000	20.22	3	12	1
5	29-9-2000	28.67	3	17	1
6	6-10-2000	30.72	3	18	1
7	13-10-2000	35.41	3	21	1
8	20-10-2000	39.29	3	24	1
9	27-10-2000	44.86	3	27	1

Soil type: coarse   variety: green   irrigation method: drip

[Start Session]   [Cancel]

case 2:

- There is a difference between the design and implementation in the output display(drip irrigation).
- There is a difference between the implemtation and the system running at water quantity and time of irrigation in the output display:

Case 3:
- There is an difference between the implemtation and the system running at water quantity and time of irrigation in the output display:

Case 4:
- There is a difference between the design and implementation in the output display(drip irrigation).

Case 5:
- There is a difference between the design and implementation in the output display(drip irrigation).

Case 6:
- There is a difference between the design and implementation in the output display(drip irrigation).

7. Conclusions

Very Important Comment:

The system is acceptable after making the necessary corrections.