



Final Deliverable

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Page : 1 /6

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Abstract This document provides the validation of the WP2, WP4 and WP5

Keyword List Pattern recognition, Harness conception process, and simulation process



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Table of contents

INTRODUCTION.....	3
WP2: PATTERN RECOGNITION	4
WP4 HARNESS.....	4
WP5 WIRING DIAGRAM SIMULATION	5
CONCLUSION	6

INTRODUCTION

This document provides the validation of the work achieved in WP2, WP4 and WP5. The work consists, in analysing the achievements of the research and the prototype efficiency with regards to predicted project achievement. Coherence of the critical case was checked. The pertinence of the extracted information is analysed.

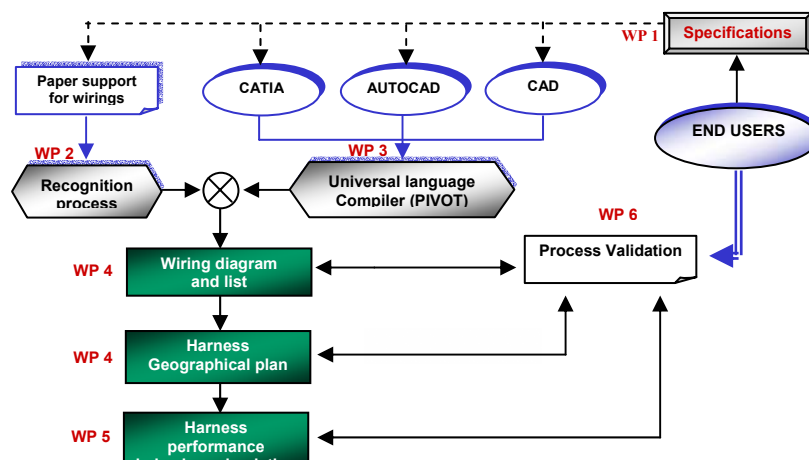
The capability of the prototype to produce robust and adequate analyse regarding to the information to treat is to be validated.

The efficiency of the FRESH prototype is verified.

- The intermediate evaluation checks:
- The process ergonomic
- The recognition process robustness and reliability
- The friendliness and time to conceive the harness
- The information display modes accuracy and representativeness
- The adequacy of harness verification tools
- The simulator human machine interface efficiency and friendliness
- The electrical continuity of the signals
- The linkage of events
- The modelling accuracy

The following chapter presents reflection concerning each of the technical tasks, contributing to the FRESH prototype achievement.

Recall of the FRESH project architecture





WP2: PATTERN RECOGNITION

The goal of this WorkPackage is to transform a wiring diagram paper into electronic files (CAD files).

The first problem to solve in pattern recognition is to transform the grey level of the bitmap into a black and white bitmap. In Fresh this is realised by a new algorithm using adaptive thresholding. Nevertheless, the human can act if there are problems. The efficiency of this filter is about 95%.

After it is necessary to find the position of the wires, the text, the symbols, the equipment and so on. Tools have been developed to answer to this request. These operations are realised automatically but nevertheless under the control of the end-user.

After this segmentation it is possible to recognise the texts and the symbols automatically and introduce the results in the CAD software.

The rate of right recognition is roughly 80%. There are a lot of critical cases: (i.e.: to do the difference between the O and the 0, the 1 and the I etc...). That's why the result it's very encouraging.

Then, the recognition of the symbols is done by the palettes
After that we have to translate the analyse in a CAD tool.

With the first prototype, we have reached our technical objective.

WP4 HARNESS

After the modification the first task is to build the wiring list (briefly, the wiring list is the list of all the wires in the schemas, and for both extremities of the wire, the information of the equipment, connectors and pins)

A copy of the Wiring list is put in an EXCEL File

In the next step, the end user must design the harness. Fresh has developed an automatic method for routing the components and the wires.

This algorithm of routing was designed and implemented in the prototype. The results are very satisfying.

After the routing operation the end-user can complete or modify this work.

A simple and ergonomic man machine interface was developed and implemented for this purpose



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Page : 5 /6

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MOCK-UP LINK

If the 3D mock-up exists, it is possible to find the length of the wires thanks to the development of an efficient algorithm.

This development allows the connection between the wiring list under EXCEL files and the 3D mock-up even if this mock-up is only an SLT file and thus enter the information of the length into the EXCEL files

Wiring

Harnes

Wiring List (ExcelFormat)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	289A1	189V-C	189V-C	F	* 9071	23	87N1	FSCP	A	FSCP	A	130				
2	450	900V-C10	900V-C10	F	* 9070	24	325TA1915	900V-C04	A	900V-C04	A	1				
3	450	900V-C10	900V-C10	F	* 9071	25	325TA1915	900V-C04	A	900V-C04	A	2				
4	PROVISION	PROVISION	PROVISION	DN	* 9072	26	325TA1915	900V-C04	A	900V-C04	A	7				
5	PROVISION	PROVISION	PROVISION	DN	* 9073	27	325TA1915	900V-C04	A	900V-C04	A	8				
6	SPARE	SPARE	SPARE	DN	* 9074	28	325TA1915	900V-C04	A	900V-C04	A	9				
7	SPARE	SPARE	SPARE	DN	* 9075	29	325TA1915	900V-C04	A	900V-C04	A	10				
8	450	900V-C10	900V-C10	F	* 9076	30	325TA1915	900V-C04	A	900V-C04	A	11				
9	450	900V-C10	900V-C10	F	* 9077	31	325TA1915	900V-C04	A	900V-C04	A	12				
10	450	900V-C11	A	900V-C11	A	* 9078	32	325TA1915	900V-C04	A	900V-C04	A	13			
11	450	900V-C11	A	900V-C11	A	* 9079	33	325TA1915	900V-C04	A	900V-C04	A	14			
12	325TA1915	900V-C04	900V-C04	F	* 9080	34	325TA1915	900V-C04	A	900V-C04	A	15				
13	325TA1915	900V-C04	900V-C04	F	* 9081	35	325TA1915	900V-C04	A	900V-C04	A	16				
14	325TA1915	900V-C04	900V-C04	F	* 9082	36	325TA1915	900V-C04	A	900V-C04	A	17				
15	325TA1915	900V-C04	900V-C04	F	* 9083	37	325TA1915	900V-C04	A	900V-C04	A	18				
16	325TA1915	900V-C04	900V-C04	F	* 9084	38	325TA1915	900V-C04	A	900V-C04	A	19				
17	325TA1915	900V-C04	900V-C04	F	* 9085	39	325TA1915	900V-C04	A	900V-C04	A	20				
18	325TA1915	900V-C04	900V-C04	F	* 9086	40	325TA1915	900V-C04	A	900V-C04	A	21				
19	325TA1915	900V-C04	900V-C04	F	* 9087	41	325TA1915	900V-C04	A	900V-C04	A	22				
20	325TA1915	900V-C04	900V-C04	F	* 9088	42	325TA1915	900V-C04	A	900V-C04	A	23				
21	325TA1915	900V-C04	900V-C04	F	* 9089	43	325TA1915	900V-C04	A	900V-C04	A	24				
22	325TA1915	900V-C04	900V-C04	F	* 9090	44	325TA1915	900V-C04	A	900V-C04	A	25				
23	1485TA4735	900V-C02	900V-C02	F	* 9091	45	325TA1915	900V-C04	A	900V-C04	A	26				
24	1485TA4735	900V-C02	900V-C02	F	* 9092	46	325TA1915	900V-C04	A	900V-C04	A	27				
25	1485TA4735	900V-C02	900V-C02	F	* 9093	47	325TA1915	900V-C04	A	900V-C04	A	28				
26	1485TA4735	900V-C02	900V-C02	F	* 9094	48	325TA1915	900V-C04	A	900V-C04	A	29				
27	1485TA4735	900V-C02	900V-C02	F	* 9095	49	325TA1915	900V-C04	A	900V-C04	A	30				
28	1485TA4735	900V-C02	900V-C02	F	* 9096	50	325TA1915	900V-C04	A	900V-C04	A	31				
29	1485TA4735	900V-C02	900V-C02	F	* 9097	51	325TA1915	900V-C04	A	900V-C04	A	32				
30	1485TA4735	900V-C02	900V-C02	F	* 9098	52	325TA1915	900V-C04	A	900V-C04	A	33				
31	1485TA4735	900V-C02	900V-C02	F	* 9099	53	325TA1915	900V-C04	A	900V-C04	A	34				
32	1485TA4735	900V-C02	900V-C02	F	* 9100	54	325TA1915	900V-C04	A	900V-C04	A	35				
33	1485TA4735	900V-C02	900V-C02	F	* 9101	55	325TA1915	900V-C04	A	900V-C04	A	36				
34	1485TA4735	900V-C02	900V-C02	F	* 9102	56	325TA1915	900V-C04	A	900V-C04	A	37				
35	1485TA4735	900V-C02	900V-C02	F	* 9103	57	325TA1915	900V-C04	A	900V-C04	A	38				
36	1485TA4735	900V-C02	900V-C02	F	* 9104	58	325TA1915	900V-C04	A	900V-C04	A	39				
37	1485TA4735	900V-C02	900V-C02	F	* 9105	59	325TA1915	900V-C04	A	900V-C04	A	40				
38	1485TA4735	900V-C02	900V-C02	F	* 9106	60	325TA1915	900V-C04	A	900V-C04	A	41				
39	1485TA4735	900V-C02	900V-C02	F	* 9107	61	325TA1915	900V-C04	A	900V-C04	A	42				
40	1485TA4735	900V-C02	900V-C02	F	* 9108	62	325TA1915	900V-C04	A	900V-C04	A	43				
41	1485TA4735	900V-C02	900V-C02	F	* 9109	63	325TA1915	900V-C04	A	900V-C04	A	44				
42	1485TA4735	900V-C02	900V-C02	F	* 9110	64	325TA1915	900V-C04	A	900V-C04	A	45				
43	1485TA4735	900V-C02	900V-C02	F	* 9111	65	325TA1915	900V-C04	A	900V-C04	A	46				
44	1485TA4735	900V-C02	900V-C02	F	* 9112	66	325TA1915	900V-C04	A	900V-C04	A	47				
45	1485TA4735	900V-C02	900V-C02	F	* 9113	67	325TA1915	900V-C04	A	900V-C04	A	48				
46	1485TA4735	900V-C02	900V-C02	F	* 9114	68	325TA1915	900V-C04	A	900V-C04	A	49				
47	1485TA4735	900V-C02	900V-C02	F	* 9115	69	325TA1915	900V-C04	A	900V-C04	A	50				
48	1485TA4735	900V-C02	900V-C02	F	* 9116	70	325TA1915	900V-C04	A	900V-C04	A	51				
49	1485TA4735	900V-C02	900V-C02	F	* 9117	71	325TA1915	900V-C04	A	900V-C04	A	52				
50	1485TA4735	900V-C02	900V-C02	F	* 9118	72	325TA1915	900V-C04	A	900V-C04	A	53				
51	1485TA4735	900V-C02	900V-C02	F	* 9119	73	325TA1915	900V-C04	A	900V-C04	A	54				
52	1485TA4735	900V-C02	900V-C02	F	* 9120	74	325TA1915	900V-C04	A	900V-C04	A	55				
53	1485TA4735	900V-C02	900V-C02	F	* 9121	75	325TA1915	900V-C04	A	900V-C04	A	56				
54	1485TA4735	900V-C02	900V-C02	F	* 9122	76	325TA1915	900V-C04	A	900V-C04	A	57				
55	1485TA4735	900V-C02	900V-C02	F	* 9123	77	325TA1915	900V-C04	A	900V-C04	A	58				
56	1485TA4735	900V-C02	900V-C02	F	* 9124	78	325TA1915	900V-C04	A	900V-C04	A	59				
57	1485TA4735	900V-C02	900V-C02	F	* 9125	79	325TA1915	900V-C04	A	900V-C04	A	60				
58	1485TA4735	900V-C02	900V-C02	F	* 9126	80	325TA1915	900V-C04	A	900V-C04	A	61				
59	1485TA4735	900V-C02	900V-C02	F	* 9127	81	325TA1915	900V-C04	A	900V-C04	A	62				
60	1485TA4735	900V-C02	900V-C02	F	* 9128	82	325TA1915	900V-C04	A	900V-C04	A	63				
61	1485TA4735	900V-C02	900V-C02	F	* 9129	83	325TA1915	900V-C04	A	900V-C04	A	64				
62	1485TA4735	900V-C02	900V-C02	F	* 9130	84	325TA1915	900V-C04	A	900V-C04	A	65				
63	1485TA4735	900V-C02	900V-C02	F	* 9131	85	325TA1915	900V-C04	A	900V-C04	A	66				
64	1485TA4735	900V-C02	900V-C02	F	* 9132	86	325TA1915	900V-C04	A	900V-C04	A	67				
65	1485TA4735	900V-C02	900V-C02	F	* 9133	87	325TA1915	900V-C04	A	900V-C04	A	68				
66	1485TA4735	900V-C02	900V-C02	F	* 9134	88	325TA1915	900V-C04	A	900V-C04	A	69				
67	1485TA4735	900V-C02	900V-C02	F	* 9135	89	325TA1915	900V-C04	A	900V-C04	A	70				
68	1485TA4735	900V-C02	900V-C02	F	* 9136	90	325TA1915	900V-C04	A	900V-C04	A	71				
69	1485TA4735	900V-C02	900V-C02	F	* 9137	91	325TA1915	900V-C04	A	900V-C04	A	72				
70	1485TA4735	900V-C02	900V-C02	F	* 9138	92	325TA1915	900V-C04	A	900V-C04	A	73				
71	1485TA4735	900V-C02	900V-C02	F	* 9139	93	325TA1915	900V-C04	A	900V-C04	A	74				
72	1485TA4735	900V-C02	900V-C02	F	* 9140	94	325TA1915	900V-C04	A	900V-C04	A	75				
73	1485TA4735	900V-C02	900V-C02	F	* 9141	95	325TA1915	900V-C04	A	900V-C04	A	76				
74	1485TA4735	900V-C02	900V-C02	F	* 9142	96	325TA1915	900V-C04	A	900V-C04	A	77				
75	1485TA4735	900V-C02	900V-C02	F	* 9143	97	325TA1915	900V-C04	A	900V-C04	A	78				
76	1485TA4735	900V-C02	900V-C02	F	* 9144	98	325TA1915	900V-C04	A	900V-C04	A	79				
77	1485TA4735	900V-C02	900V-C02	F	* 9145	99	325TA1915	900V-C04	A	900V-C04	A	80				
78	1485TA4735	900V-C02	900V-C02	F	* 9146	100	325TA1915	900V-C04	A	900V-C04	A	81				
79	1485TA4735	900V-C02	900V-C02	F	* 9147	101	325TA1915	900V-C04	A	900V-C04	A	82				
80	1485TA4735	900V-C02	900V-C02	F	* 9148	102	325TA1915	900V-C04	A	900V-C04	A	83				
81	1485TA4735	900V-C02	900V-C02	F	* 9149	103	325TA1915	900V-C04	A	900V-C04	A	84				
82	1485TA4735	900V-C02	900V-C02	F	* 9150	104	325TA1915	900V-C04	A	900V-C04	A	85				
83	1															



Final Deliverable

Ref.: FRESH_D6.1

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Page : 6 /6

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CONCLUSION

Specific evaluation tasks were planned during the FRESH project, regularly checking the achievements and the milestones. This process has been lead efficiently by the technical partners.

Globally, each technical objectives of the FRESH project has been reached: first operational prototype, algorithms, first demonstration at the Bourget Air Show...

Some improvements are envisaged for the last period of the FRESH project.