

AVITRACK



Contract n° AST3-CT-2003-502818

D.5.4a - 5.5a
First tracking &
understanding prototype

Abstract: This document presents achievements done during the first Tracking and Understanding integration in Avitrack prototype.



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1. INTRODUCTION

This document is a deliverable 5.4 & 5.5 related to the work package 5 “Prototyping” of the AST3-CT-2003-502818 project AVITRACK. This document presents the results achieved during the first integration.

Qualitative results of this first integration are not part of this deliverable and are addressed in Deliverable 6.1 about scene tracking evaluation.

2. PROTOTYPE OVERVIEW

The first integration of tracking and understanding results will allow building a first version of the prototype, bringing together pieces made by different laboratories.

This integration also corresponds to a visible step in project life where significant components are cooperating together providing the first results in real time.

2.1. COMPONENTS INTEGRATION

The following schema presents the components being integrated during this task:

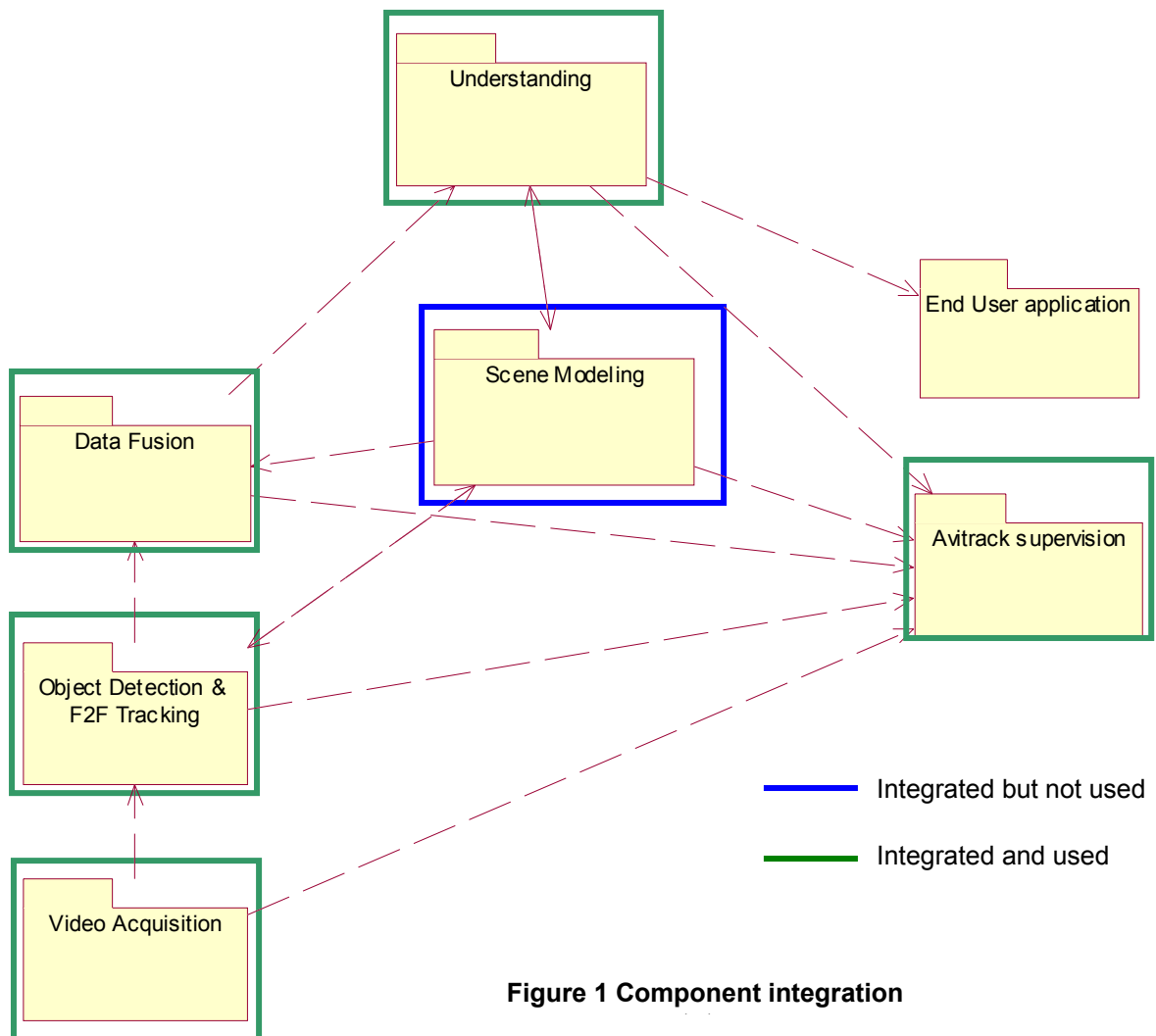


Figure 1 Component integration

As shown in

, this first integration does not involve all modules, some of them being still in development.

- Component Video acquisition is fully integrated in its off-line mode where it delivers pre-recorded video.
- Component Frame-To-Frame (that detects mobile objects in video) is integrated and running.
- Component Data-fusion is integrated yet in a first version.
- Component Model-Manager is integrated but not used now as models are not used today for object classification.
- Scene understanding module is integrated and running, using today one camera view.
- Avitrack supervision tool is partially developed and integrated and used.

2.2. COMMUNICATION OBJECTS

Communication objects have been created allowing each component to publish its results. For each of them an idl file corresponding to the data been transferred is created and interfaces to store and read these results using XML format.

All other components that need access to these objects just registers themselves as clients, being then notified each time a new data is available.

3. PROTOTYPE RESULTS

As explained in deliverable [5.1b](#), hardware infrastructure for the AVITRACK prototype involves specific bi-processor servers for high CPU consuming tasks like the Frame-to-frame component.

This first integration on such servers allows to verify the dimensioning of needed CPU and to verify that the targeted real-time scale is realistic. This section will present the tests and validation made during this integration.

3.1. VIDEO STREAMING VALIDATION

This first integration has been used to validate in real conditions the Video streaming components.

The video server can be run in different modes, one can configure:

- The time between two sent of frames. 100 % means normal time interval between two frames, 200% means twice slower...
- The frame step: 1 means the server sends every frames, 2 means the server streams every two frames.

Several tests have been made with video two long sequences to validate the streaming solution. A special video client was developed to measure the number of frame lost during streaming for each channel. This

client has shown that in a standard network (100 Mbs), it is possible to stream up to eight video channels without any loss, the video server running either at 6.25 fps or 12.5 fps. The time taken to stream these videos has been evaluated and compared to their durations in order to verify that the system always utilizes a real time streaming scale.

In conclusion, the video streaming capabilities have been validated.

3.2. PERFORMANCES TESTS

Some initial tests done to test the performance of part of the AVITRACK system (video delivery, tracking and data fusion) using 2 machines, up to 4 trackers, and CORBA communications.

The tests performed are:

TEST 1	<ul style="list-style-type: none"> • Most realistic test with respect to hardware configuration (2 trackers per machine; 1 machine for data fusion) • System running at the required frame rate (12fps).
TEST 2	<ul style="list-style-type: none"> • Most realistic test with respect to hardware configuration (2 trackers per machine; 1 machine for data fusion) • System running closer to the current achievable frame rate (7fps).
TEST 3	<ul style="list-style-type: none"> • Testing Data Fusion with more connections (4 trackers in all; 2 trackers per machine) • System running at close to the current achievable frame rate (6fps).
TEST 4	<ul style="list-style-type: none"> • A test showing performance if only half the hardware configuration is used (4 trackers per machine instead of the planned 2). • Running at close to the current achievable frame rate (6fps).

Table 1 Tests performed

3.3. PERFORMANCES OBSERVATIONS

From the above tests, one can observe:

- The present system suffers from heavy frame loss if running at 12 fps. When running at the current achievable rate of 6 to 7 fps, frame loss is minimal. Further optimisation of the tracking and data fusion modules will be attempted to increase the processing rate that can be achieved.
- Increasing the amount of buffering used for storing images in the tracker, should also help to decrease frame loss and improve performance of the trackers.
- With 2 trackers running on each server, CPU utilisation is of about 80%. It might be possible to try and increase utilisation to get a better performance.

3.4. HARDWARE OPTIMIZATION AND TEST

We made complementary test using Intel Hyper-Threading option on the Xeon bi-processor. Hyper-Threading Technology also delivers faster response times for multi-tasking workload environments.

The results indicate that the Hyper-Threading optimization should be kept in addition to process ameliorations.

4. CONCLUSION

During this integration, a first version of the prototype has been set-up that integrates:

- A video server – playing pre-recorder video,
- The Frame-to-frame component running on different CPU nodes and analysing videos.
- A version of the Data-fusion module that receives each Frame-to-frame output.
- The video understanding module receiving in real-time frame-to-frame outputs and processing to the activity recognition.
- A simple version of the HCI to receive and display results from each of these components.

All components are communicating using pre-defined patterns, and the system is fully re-configurable: one can easily change the number of channels processed and which component is deployed on which node.

This first integration shows that:

- **The video service and the frame tracker may run at 12.5 fps,**
- **Version already runs in real-time at 6fps, and succeeds in recognizing some simple scenarios.**

Even if improvements are expected to get a better frame rate for the global solution (Hyper Threading, frame buffering...) and also with the integration of new modules like object categorization, this first step already represents an important achievement.