- APROVIS3D -

Analog PROcessing of bioinspired VIsion Sensors for 3D reconstruction

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Contractor: **UCA**		
Prepared by: **Jean Martinet**		
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	Role / Function	Name	Organisation
Prepared by	Project Coordinator/WP0L	J. Martinet	UCA
Checked by	Quality check	All partners	All
Released by	Project Coordinator/WP0L	J. Martinet	UCA
Approved by	Project Coordinator/WP0L	J. Martinet	UCA

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1 Introduction

During the implementation of the APROVIS3D project, the management process identifies and monitors technical and management risks as well as any other issues that might affect the project progress towards its objectives, in order to carry out mitigation actions as early as possible.

1.1 Purpose

This document D0.2.2 deliverable of the APROVIS3D project defines the Risk Identification and Management Plan implemented in the project.

Risks can arise from unexpected technical difficulties or scientific findings, poor communication or co-operation between the partners, resource shortage by the partners, objectives not achievable in terms of budget or feasibility, partners leaving the consortium, human operational errors: planning errors, poor quality, etc.

1.2 Roles and responsibilities

Each partner has the responsibility to report immediately to their respective Work Package (WP) Leader and to the Project Coordinator any risky situation that may arise and may affect the project objectives or their successful completion. Any change in the time schedule of the deliverables or in the allocated budget must be reported to the corresponding WP Leader or to the Project Coordinator.

In case of problems or delays, the Executive Committee will be consulted, and it may set up task forces in order to take the necessary actions. In case there is no resolution, the EC will establish mitigation plans to reduce the impact of risk occurring. Responses may include: strengthened supervision, adjustments to project strategy, changes to implementation arrangements and changes in budget allocations.

Quality and risk management will be performed under the supervision of the Project Coordinator, who will be responsible for the following tasks:

- Monitoring the project to identify any new or changing risks.
- Updating the initial risk list with the support of the consortium.
- Contributing to risk mitigation planning.
- Coordinating with the consortium to monitor risks and implement risk response strategies.
- Managing quality control procedures on deliverables.
- Reporting regularly to the consortium.
- Making the final decision on risk actions, in co-ordination with the Work Package Leaders.

Work Package (WP) Leaders are responsible for the following tasks within their work package(s):

- Identifying and describing any risk.
- Helping to identify the risk owners and assisting in developing the risk response strategies.
- Performing the risk response steps assigned.
- Reporting on the progress of the risk response to the Project Coordinator.
- Assisting the Project Coordinator in activities associated with risk monitoring and control.

2 Documentation

2.1 Applicable and Referenced Documents

#	Id	Description	Identifier (Ed Rev)	Date
AD1	FPP	Full Project Proposal	1.0	15.01.2019

2.2 Glossary and Terminology

Acronym	Definition
WP	Work Package
SNN	Spiking Neural Network
ML	Machine Learning
PCB	Printed Circuit Board
VR	Virtual Reality

3 Implementation risk analysis

This project involves partners from different fields of study. Even though the team has experts for each task, there are specific risks in the communication of this knowledge during the project timeline and in particular of deadlocks which could induce delays or bottleneck hindering the realization of the project demonstrator. To mitigate the risk, we developed this risk analysis plan to measure risks coupled with four achievable milestones relevant to this project to align the time-bound achievements of different partners.

3.1 List of identified risks

To help the detection of deadlocks, we use the implementation risk analysis table (Table 1), which describes specific risks, their likelihood and potential impact as well as a mitigation plan. In particular, risks are originating either from delays in the development process, or an incorrect estimation of tasks scaling across disciplines. Corresponding milestones allow synchronizing tasks progress across disciplines. Table 1 below gives a list of risks identified in the project.

Risk description	Likelihood	Impact	Mitigation plan
Delayed implementation of the foveated sensor	Low	High	Use existing event cameras and emulate the foveation control.
Embedded resources are too limited for processing stereo-event camera	Low	Medium	Use a single sensor and motion parallaxe to infer depth.
Power requirement of foveation control are higher than expected	Low	Medium	A trade-off between power consumption of foveation control and foveation power communication and processing saving should be achieved accordingly.
Integration of mixed digital-analog subsystems is not possible	Low	High	Labs tests of the different subsystems to have measured data of the overall system. Develop a system with less functionality that can be demonstrated anyway.
Requirement of designed network is too complex for the available hardware	Medium	Medium	Use an additional low power digital microcontroller emulating some SNN populations.
Delayed development of the overall integrated system	Medium	Medium	Perform autonomous flying missions with digital camera and additional navigation sensors while emulating the SNN detection algorithm on a digital processor until the overall integration is complete.
During the data collection procedure, the classic visual servo scheme presents stability and /or robustness issues.	Low	Medium	The data collection will be realized with the following ways: • The vehicle will fly autonomously over the coastline using GPS way-point tracking. • The vehicle will be manually guided by a human operator over the coastline.
During the data collection procedure, the event camera fails to provide quality data for training.	Medium	Medium	We will either try a physical stabilization solution, or a software stabilization / noise filtering

Delayed development of the overall integrated system.	Medium	Medium	Perform autonomous flying missions with digital camera and additional navigation sensors while emulating the SNN detection algorithm on a digital processor until the overall integration is complete.

Table 1: Implementation risk analysis table

3.2 List of milestones

To assure that the project does not get deadlocked in the iteration of WP1-WP5 (see the WP diagram in Section 2.1 of the FPP), we have identified four transversal milestones that define interdisciplinary objectives to align in time the evolution of the different WP, allowing the continuous project flow (see Gantt diagram in the FPP).

Milestone	DM	WP involved	Title
M1	6	WP1	• Scenarios, use cases, and requirements are defined and accepted by all partners.
M2	18	WP0 WP2-3-4	• Mid-term review. Analog processing subsystem is implemented. All core components (stereo-event camera, SNN-ML, system architecture) are ready for integration
M3	30	WP2 to WP5	• Final version of components are integrated into the flying demonstrator, ready for validation.
M4	36	All	• Project end: all deliverables are ready, final meeting

Table 2: Milestones

3.3 Specific per-WP analysis (when relevant)

3.3.1. WP2

- Risk 1. Resolution specifications for the demonstrator task are not achievable for the size and complexity of the foveated event sensor for the budgeted area and technological node. A low-resolution sensor will be fabricated as proof of concept. A larger resolution can be achieved if necessary, for the demonstration task by tiling several sensors on the same PCB to cover a larger visual area. Although there will be gaps in the visual area between sensors.

- Risk 2. There is a design error in the event camera prototype that is discovered during test at M20. Depending on the nature of the error, if the error is not catastrophic, we will try to see if the sensor can still be used for the demonstration using some external circuitry to compensate it at the PCB level. If the error is catastrophic, we will correct it and refabricate the circuit using our own resources funds to pay the refabrication.

In order to minimize this risk, we will fabricate and test small circuits and a small prototype before the fabrication of the bigger prototype.

3.3.2. WP3

The main risk lies in data collection and data quality. The mitigation plan here is to generate event data from standard video (using e.g., Scaramuzza library) or use synthetic data, or from VR.

3.3.3. WP4

- Risk 1. Availability of the technology in the right form factor. Mitigation plan: work with remote tools and with larger form factor devices.
- Risk 2. Interfacing different early technologies might affect the final system integration. Mitigation: working with standard interfaces.

3.3.4. WP5

- Risk 1: Stability and/or robustness issues with the visual servo system, Mitigation plan includes the use of GPS assisted flight over selected coastline and/r the use of manual controls
- Risk 2: training data cannot be provided due to event sensor failure. Mitigation plan includes the combined use of emulated SNN algorithm by using a digital processor along with digital camera and sensors in an autonomous flight mode.