Autonomous Ocean Bottom Seismometers Signal Transmission

Ocean bottom seismometers can be used in a wide number of fields within the Earth Sciences: from monitoring and analysis of seismicity and seismic hazard evaluation in margins, the seismic awareness and the control of the stability of the continental shelf, to the study of the structure and physical properties of the crust and the measure of stresses in civil engineering works. In order to actively progress in the new design of these underwater sensors (marine seismometers), we must critically consider all the previous measurements achieved with the available equipment. From these preceding results, we have already learnt many crucial aspects related to the reliability and robustness of the entire equipment which includes the mechanical structure, the electronic and the design of electronic-cartridge components: Optimisation signal/noise ratio, systematic signal processing, clock stability and time precision, On-line control, and the ability to protect the whole system including the recording packages when it moves down to the seafloor.

Up to 80% of the failures in submarine systems occur in the first three hours after deployment. Therefore, for long-term deployment, it is necessary to control the functioning of the system shortly after it has reached the sea bottom.

Moreover, the implementation of online monitoring will certainly increase the consistency of the system, and in many aspects, facilitate critical information to take *real time* decisions concerning logistics and possible reorganisation of the cruise, and hence increase the confidence and effectiveness of system.

The performance of the whole system obtained from previous testing and observations allows us to recognise the need for continuous communication between the marine platform and the sensor. Therefore, the new design will incorporate a device permitting permanent communication with the sensor whether it is undersea or at the surface. In this way it is possible to know its functioning and location at any moment. To achieve this objective it is essential to reduce power consumption and to evaluate (filter) the occurrence of reverberations and spreading on time and frequency.

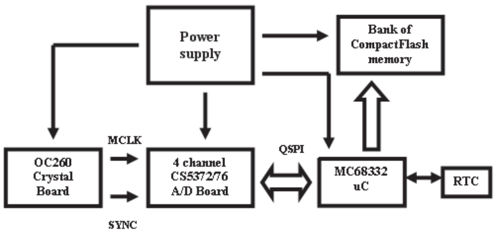

Figure: Acquisition system block diagram

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Non-Smooth Bifurcations in Electronic

Abstract –One-parameter nonsmooth bifurcations occur in piecewise-smooth sets of ordinary differential equations. Motivated by applications, 'bifurcation' is defined as a nonsmooth transition with respect to a codimension-one discontinuity boundary in phase space. Only local bifurcations are considered, involving equilibria or a single point of boundary interaction along a limit cycle. Filippov systems are specially considered because its application in electronic circuits, as power electronic converters. A rich array of dynamics are revealed, involving the sudden creation or disappearance of attractors and bifurcation diagrams with sharp corners. An example of a variable structure circuit, which is a first step in designing a DC-DC converter, is studied with some detail.

Keywords – DC-DC Converters, Nonlinear Dynamics, Bifurcations.

1. Introduction

DC-DC converters are generally systems of Filippov type, where both two vector fields F and G are linear. Thus they provide good examples and applications of the theory which has been shown previously. In the scientific community it has been shown that a DC-DC Boost converter can exhibit several nonsmooth transitions [1]. Also several models of DC-DC Buck converter have been studied [2]. We review this example in the following, where several nonsmooth transitions are reported. Usually, in DC-DC converters every modelled topology is linear and thus the orbits can be computed taking advantage that analytical expressions of the solution are known in each topology. Thus, they are glued at the switching instants when the topology changes. It is well-known that sliding motions over the discontinuity surface can also exist.