



Building a performance protocol of a low cost seismograph

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The low cost seismograph under study consists of low cost open source hardware and software microprocessor boards (Arduino Uno R3 and Raspberry Pi 3 B+), customized low noise design signal amplifiers, low power dissipation sophisticated power supply, two (2) kinds of earth ground shaking sensors a) Ceramic Accelerometer with cutoff frequency $f_c=0.15\text{Hz}$ and b) moving coil geophone with cutoff frequency $f_c=4.5\text{Hz}$. The signals from the two sensors are amplified independently, while an active second order low-pass anti-alias filter and an 8th order active low-pass anti-alias filter have been used. Finally, a low-cost microprocessor board is responsible for digitizing the analog data from the amplified signal of the sensors with a frequency sampling rate of 345Hz. The aim of the present work is to design and test a systemic protocol in order to evaluate the performance of the proposed low cost seismograph for monitoring local to regional seismicity and micro seismicity. The proposed low-cost system was installed in an area of high seismic activity (Lefkada Island – Village Evgiros) and the recordings are transmitted to the database continuously from the day of its installation up today. Thus have create an amount of data for more than 280 days and all of those data have been stored to our database. Collocated with a high resolution 24 bits digitizer equipped with a broad band seismometer give us the opportunity to compare the recordings. To this end, a testing list of 15 local events has been created with different epicenters and magnitudes. For each event the recording signals have been analyzed in terms of a) power spectrum analysis, b) estimation of first arrival times of both P and S waves, c) signal amplitudes and d) earthquake duration. The choice of those specific measures was done in order to evaluate the performance of the low-cost seismograph in terms of certain seismic parameters such as magnitude, epicenter and source properties. Initial results in terms of the proposed protocol are also presented showing an adequate performance of the propose low cost seismograph.

Keywords:

low-cost instruments, Ionian islands, performance protocol

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