ID25 CALIBRATING THE MOVEMENT OF AN UNDERWATER CRAWLER USING PULSE WIDTH MODULATION (PWM)

AHMAD FALAHZADEH[97], DANIEL MIHAI TOMA[24], MARIE LE BERIS[98], ENOC MARTINEZ[26], MATIAS CARANDELL[4], MARC NOGUERAS[17], JACOPO AGUZZI[35], JOAQUÍN DEL RÍO[19]

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ABSTRACT

The development of monitoring protocols based on cabled marine observatories is becoming strategic to acquire real-time multiparametric biological and environmental data. Unfortunately, most cabled observatories depend on fixed cameras to perform video-based ecological monitoring. Therefore, docked mobile platforms are useful, to extend underwater observatories surveillance radius and improve their performance and functionality [1]. In this study we present an underwater crawler [2] connected to the OBSEA (www.obsea.es) [3] as European Multidisciplinary water column and Seafloor Observatory EMSO Testing-Site [4].

The crawler in [2] moves by sending Pulse Width Modulation (PWM) signals from the ODROID C4 controller board [5] to the motor controllers (Faulhaber SC5008S), which provide then power to the motors(Faulhaber 3564K 048B). The asymmetrical behaviour of the motor controllers, the motors, and the tracks, in forward and backward directions, cause the deviation of the crawler from a straight trajectory (Figure 1) [6].

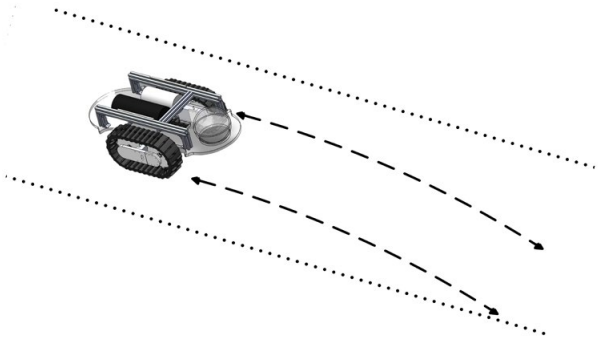

Figure.1 Deviation movement of the crawler in forward direction

To tackle this issue and compensate for the speed discrepancy between the two motors, the PWM signals applied to each motor were calibrated. For this purpose, the PWM applied to one of the motors was considered as a reference (in our case, right motor and PWM1). The PWM applied to the other motor (left motor and PWM2) was consequently calibrated in both forward and backward direction (Figure 2).

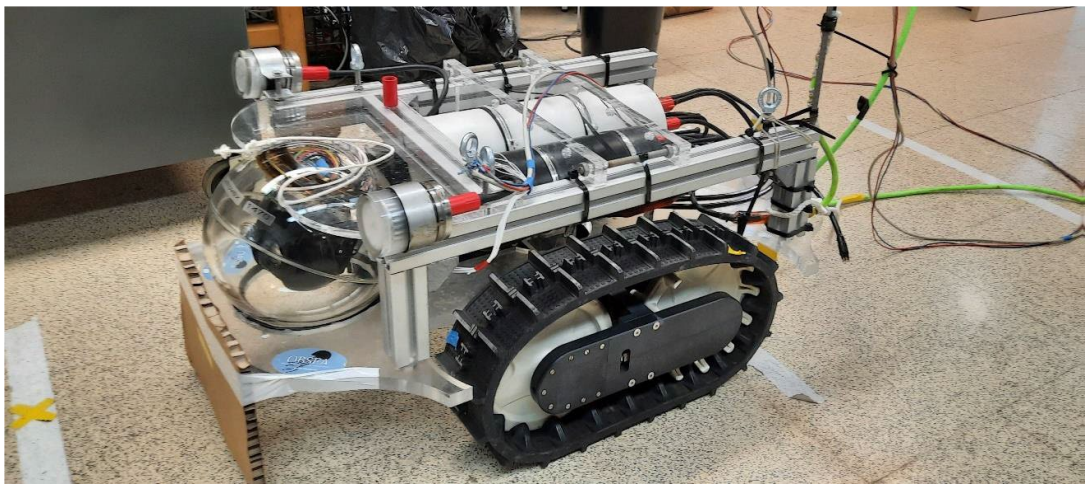

Figure 2 Crawler and measuring marks (white tape) on the floor

The speed of motors for the PWM signals and the results of this calibration process are shown in Figure 3. In particular, the measurement results illustrated in Figure 3A shows that applying an equal amount of PWM, motor 2 moves faster than motor 1. Therefore, in order to compensate for this difference and reduce the speed of motor 2, the PWM2 was decreseddd, accordingly to the PWM1 (Figure 3B).

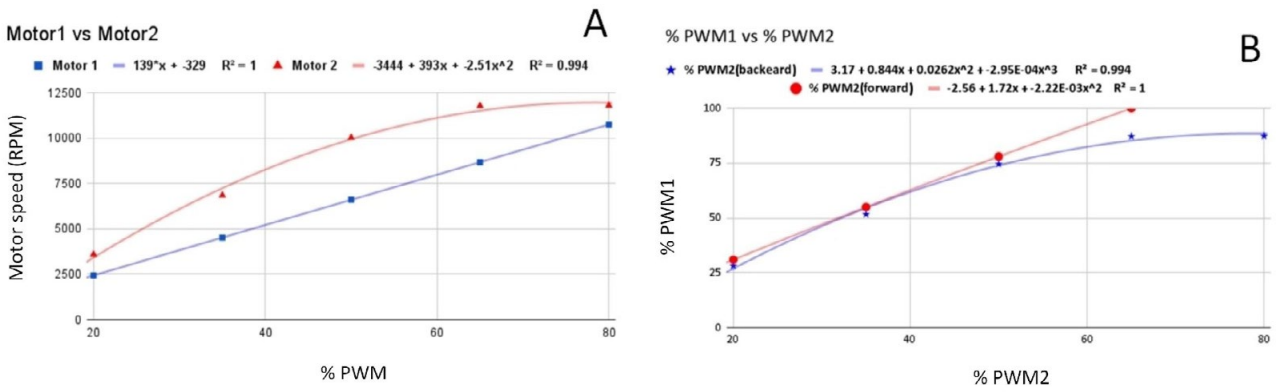

Figure 3 PWM pulses and speed of motors (A) and calibrated PWM2 based on PWM1 for the forward and backward movements (B).

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