



# Continuous Parameter Control Using an On/Off Sensor in the Augmented Handheld Triangle

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**Abstract.** In this work, we present Triaume, an augmented musical percussion instrument based on the triangle. The augmentation proposal for this instrument is based on a capacitive thumb sensor, that allows controlling digital musical devices and at the same time, preserves the original instrument idiomatic inside the context in which it is inserted. Triaume's interaction proposals were built upon Brazilian music genres idiomatic, such as Forró, Xote, and Baião. The instrument invasiveness is further reduced through the use of an external device (an application running on a smartphone) for emulating faders related to sound parameter configuration. At first, we used the sensor as an on/off button able to trigger pre-programmed percussion samples, which can be synchronized with the triangle's acoustic sounds. This mechanism can be adjusted for triggering on pressing or releasing the sensor. Next, we convert the digital signals acquired by the sensor to continuous values by the on/off signal filtering. Such signal rectification and filtering system allows gradual change of continuous sound synthesis parameters, dealing with the on/off signal low robustness, turning it into a more controlled signal. Triaume can be inserted in the contexts of traditional and avant-garde music, also motivating further studies for applying the mechanism used on it in other percussion instruments.

**Keywords:** Triangle · Capacitive sensor · Pulse Width Modulation (PWM) · Augmented instrument · Brazilian music

## 1 Introduction

Traditional music instruments can be augmented with electronic sensors, which can acquire signals to control devices like synthesizers and effect processors. These sensors usually exploit the so-called spare bandwidth [4], that is, movements or limbs that are not used in the traditional playing techniques and, therefore, can be used for other purposes. Augmented instruments can provide new expressive possibilities when compared to their traditional counterparts.

This work presents an augmentation proposal for the triangle, a handheld non-pitched percussion instrument traditionally used in several regional Brazilian music genres such as Forró, Xote, and Baião [6]. The acoustic triangle is usually held with