

# Experimental Interactive Luminous Ballet Outfit

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## Introduction

In dance shows, notably classical ballet, the costumes are considered as an important element for the success of the performance [1]. The costumes contribute to the transmission of the narrative of the show and the identification of the characters within the plot. Like the scenography design, its design expands the media related to the performance and atmosphere of the show.

The textile surface design and the shape of the suit traditionally constitute the material elements of the garment that promote communication. However, with the exponential increase in production capacity, consumption and competition, the design thinking and the culture of innovation become intrinsic concerns to the scenario of this segment. As a result, textile designers are continually striving to develop new concepts in the segment [2], and some of them seek to break paradoxes through transdisciplinary experiments involving design, engineering, electronics, fashion and art.

Wearable technologies, e-textiles, electronic textiles and smart fabrics are terms that indicate the application of electronic and other technologies, aiming to offer additional functions to worn objects, e.g. clothing and accessories [3]. The advance of researches in this area is growing and has close relationship with the wide development of computing, its miniaturization, democratization and multiple applications at individual and customized levels.

This article aims to present the development of an experimental product design based on interactive surface design, which proposes the broadening of dance communicability by the design of clothing in technological scenarios. Integrating, by means of sensors located in the shoes, the movements of the dance to the aesthetic and luminous answers on the surface of the costumes.

## Materials and methods

Three parts make up the interactive outfit: the costume itself, the central controller with the LEDs and the sensing pointe shoes.

The central controller uses an Arduino Nano, a three-axis MMA7361L analogue accelerometer module and the nRF24L01+ communication module to receive force information from the shoe modules. WS2813 programmable LED strips are distributed over the textile support. The pointe shoes are devised with flexible piezoresistive force sensors to detect the “en pointe” position. This information is sent to the central controller using an nRF24L01+ and an Arduino module.

Interactivity is implemented through chromatic variations and brightness, related to the movement intensity, with a sense of directionality of the movement gained by lighting the individual LEDs according to the movement direction. When the “en pointe” position is detected, the performance is “rewarded” with an intense glitter effect.



**Figure 1.** Ballet outfit reacting to motion

## Results

Extensive tests carried out by a ballerina have shown that, after an adaptation phase, the dialogue between the music, the ballerina and the light interactions becomes a new, enriching experience both for the performer as well as for the public. Selection of adequate music and performances to maximise the visual results is a fundamental requirement. This paper will describe and explore the results and personal experiences.

## Conclusions

The interactive outfit created has pleased all of the participants in this experiment, and it leaves much potential for further exploration. Besides the artistic possibilities, other applications are pictured. The pointe shoes may, for example, be used to help trainees correcting the position of their feet, using modified sensors able to measure position and pressure distribution of the tip in contact with the floor. For a commercial product, further miniaturization of the electronics and a more robust integration of the LEDs is necessary.

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