

# Chapter 20

## Vojta–Therapy: A Vision–Based Framework to Recognize the Movement Patterns

**Muhammad Hassan Khan**

*Research Group of Pattern Recognition, University of Siegen, Siegen, Germany*

**Marcin Grzegorzek**

*Faculty of Informatics and Communication, University of Economics in Katowice, Katowice, Poland*

### ABSTRACT

*This paper proposed a novel computer vision-based framework to recognize the accurate movements of a patient during the Vojta-therapy. Vojta-therapy is a useful technique for the physical and mental impairments in humans. During the therapy, a specific stimulation is given to the patients to cause the patient's body to perform certain reflexive pattern movements. The repetition of this stimulation ultimately makes available the previously blocked connections between the spinal cord and brain, and after a few sessions, patients can perform these movements without any external stimulation. In this paper the authors propose an automatic method for patient detection and recognition of specific movements in his/her various body parts during the therapy process, using Microsoft Kinect camera. The proposed method works in three steps. In the first step, a robust template matching based algorithm is exploited for patient's detection using his/her head location. Second, several features are computed to capture the movements of different body parts during the therapy process. Third, in the classification stage, a multi-class support vector machine (mSVM) is used to classify the accurate movements of patient. The classification results ultimately reveal the correctness of the given treatment. The proposed algorithm is evaluated on the authors' challenging dataset, which was collected in a children hospital. The detection and classification results show that the proposed method is highly useful to recognize the correct movement pattern either in hospital or in-home therapy systems.*

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## 1. INTRODUCTION

Vojta-therapy (VT) is a useful technique to treat the disorders in the central nervous and musculoskeletal system, and is very effective for small babies of less than 6 months. The patients suffering from such diseases are unable to make some specific movements in their different body-parts, in the normal manner. VT is based on the principle of Reflex Locomotion (RL), that is, the patient's central nervous system can be activated by giving the correct simulation, assuming that it is still partially intact. RL is a combination of Reflex Creeping in prone lying position and Reflex Rolling from supine and side lying positions, which enable the elementary patterns of movement in patient. The various lying positions of a patient during the therapy are shown in Figure 1.

*Figure 1. Example of child's lying positions during the therapy process. Reflex creeping (a) prone lying position, and Reflex rolling (b) supine lying position and (c) side lying position. Photo courtesy: Red Cross Children Hospital, Siegen, Germany.*



According to Prof. Dr. Václav Vojta (a child neurologist from Czech Republic, who introduced this treatment), one can observe motor reactions occurring throughout the patient's body when a specific stimulation is given to him/her, while lying in one of the above mentioned positions. Therefore, the therapists exploit a combination of 10 different zones on a patient's body by putting light pressure on this area and resistance to the current movement (e.g., the tendency to rotate the head during reflex creeping) to cause the patient's body to perform certain reflexive movement patterns. The repetition of this stimulation many times ultimately make available the previously blocked connections between the patient's spinal cord and brain, and the patient is able to perform similar movements without any external stimulation. VT has been effectively used to treat various diseases like cerebral palsy, peripheral paralysis of the arms/legs, hip joint dysplasia, problems in breathing, swallowing and chewing functions<sup>1</sup>.

VT can be applied to the patients of any age group but it is extremely effective for young babies of less than 6 months because most of the developmental changes take place in the early stage of a child's life. For a treatment to be successful; the therapy session of 5-20 minutes should be performed several times in a day or week and this process can last for several weeks or months. Therefore, the therapists explain the goal and objective of the therapy and recommend an in-home continuation of the therapy as well. The therapy program is then determined in regular intervals in accordance with a child's improve-

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