Activity-Based Computing [1] aims to capture the state of the user and its environment by exploiting heterogeneous sensors in order to provide adaptation to exogenous computing resources. In some smartphones these sensors are embedded by default and we benefit from this to classify a set of physical activities (standing, walking, laying, walking, walking upstairs and walking downstairs) by processing inertial body signals through a supervised Machine Learning (ML) algorithm for hardware with limited resources. A comparison with the traditional SVM shows a significant improvement in terms of computational costs while maintaining similar accuracy, which can contribute to develop more sustainable systems for AmI. Since the appearance of the first commercial hand-held mobile phones in 1979, it has been observed an accelerated growth in the mobile phone market which has reached by 2011 near 80% of the world population [2]. Experimental results and conclusions of this research are described in Sections 4 and 5. The SVM algorithm was originally proposed only for binary classification problems but it has been adapted using different schemes for multiclass problems such as in [9]. In particular, we have chosen the One-Vs-All (OVA) method as its accuracy is comparable to other classification methods as demonstrated by Rifkin and Klautau in [14], and because its learned model uses less memory when compared for instance to the One-Vs-One (OVO) method. This is one key concepts in which AmI relies on. In this paper, we employ smartphones for human Activity Recognition with potential applications in assisted living technologies. There, the experimental set up for capturing the data and the mathematical description for the proposed Multiclass Hardware Friendly Support Vector .Machine (MC-HF-SVM) are explained