

**CHENNAI – PONDICHERRY**

**Centroidal Voronoi Tessellations- A New Approach to Random Testing**

**Abstract**

Although Random Testing (RT) is low cost and straightforward, its effectiveness is not satisfactory. To increase the effectiveness of RT, researchers have developed Adaptive Random Testing (ART) and Quasi-Random Testing (QRT) methods which attempt to maximize the test case coverage of the input domain. This paper proposes the use of Centroidal Voronoi Tessellations (CVT) to address this problem. Accordingly, a test case generation method, namely, Random Border CVT (RBCVT), is proposed which can enhance the previous RT methods to improve their coverage of the input space. The generated test cases by the other methods act as the input to the RBCVT algorithm and the output is an improved set of test cases. Therefore, RBCVT is not an independent method and is considered as an add-on to the previous methods. An extensive simulation study and a mutant-based software testing investigation have been performed to demonstrate the effectiveness of RBCVT against the ART and QRT methods. Results from the experimental frameworks demonstrate that RBCVT outperforms previous methods. In addition, a novel search algorithm has been incorporated into RBCVT reducing the order of computational complexity of the new approach. To further analyze the RBCVT method, randomness analysis was undertaken demonstrating that RBCVT has the same characteristics as ART methods in this regard.