

**MASTER'S PROJECT (SPRING 2018)****TOPIC:** *Applying the VCG Mechanism in Online Auctions for Product Bundling***PRESENTOR:** Minh Hai Ha**ADVISOR:** Dr. Haiping Xu**DATE & TIME:** Friday, February 16, 2018, 2:00 PM**LOCATION:** Dion 302E (Demo)**COMMITTEE MEMBERS:** Dr. David Koop and Dr. Ming (Daniel) Shao**ABSTRACT**

Auctions have been used since antiquity for the sale of a variety of objects, which offer the advantage of simplicity in determining market-based prices. With the help of the fast-growing Internet environment, there has been tremendous growth in the number of online auction websites, for example eBay, where individuals can search for the values of goods sold there, and also list items for sale under common auction rules. Based on the sellers' different purposes, there are three types of auctions that are most commonly used in online auctions, namely English auction, Generalized Second-Price (GSP) auction (used by Google), and Vickrey-Clarke-Groves (VCG) auction (used by Facebook, Instagram and Twitter). In this project, we adopt the VCG auctions, which are sealed auctions of multiple items, where bidders can place their bids, but cannot see other people's bids. The winners of a VCG auction are bidders with the highest bids, but they only need to pay as much as the harm they cause to other bidders by entering the auction. The VCG mechanism involves two major steps, which are to determine the winners by computing the allocation that maximizes the social welfare, and to charge the winners by their harm to others. To study the VCG approach for online products, we implemented the VCG mechanism in Java for multi-unit bundling auctions, where a seller tries to sell an item with multiple units, and bidders may place bids on a bundle of units. We used dynamic programming to solve the optimal allocation problem, and calculated the trading price for each winner. In addition, we analyzed how the bidders' bidding behavior might affect the utilities of the seller as well as those of the bidders. The experimental results show that the mechanism guarantees both the seller and the bidders' profits are well protected when the bidders' bidding behavior changes.