SYSTEM AND METHOD FOR DETERMINING ASYMMETRIC MERCHANT VISIBILITY

TECHNICAL FIELD

[0001] Various aspects of this disclosure relate to a system for determining asymmetric merchant visibility. Various aspects of this disclosure relate to a method for determining asymmetric merchant visibility. Various aspects of this disclosure relate to a non-transitory computer-readable medium storing computer executable code comprising instructions for determining asymmetric merchant visibility. Various aspects of this disclosure relate to a computer executable code comprising instructions for determining asymmetric merchant visibility.

BACKGROUND

[0002] Deliveries (e.g., instant deliveries, like food delivery, medicine delivery, grocery delivery), provides a lot of convenience to the e-commerce consumers, by delivering items in a short period. This is known as instant delivery SLA (Service Level Assurance). To guarantee a high level of SLA, usually a circle with the center of the merchant is predefined and only consumers within the circle can see and order from the merchant in their user device. The radius of the circle could be straight line distance/time or routing distance/time. This is known as symmetric merchant visibility control.

[0003] However, current approaches using symmetric merchant visibility control does not consider the asymmetric demand distribution and batching potential or future driver earnings after delivery. Further, two delivery points in one residential or office zone may have different lists of merchants.

[0004] Current existing approach of delivery prediction is only based on dynamic radius (distance or time based) around the merchant. Therefore, driver utilization and revenue are not optimized and consumer experience is also compromised.

SUMMARY

[0005] Therefore, there is a need for an improved system for merchant visibility for users. There is also a need to increase user and driver satisfaction.

[0006] An advantage of the present disclosure may include an improved system for merchant visibility for users by asymmetric merchant visibility resulting in higher user satisfaction.

[0007] An advantage of the present disclosure may include higher user satisfaction due to increased order allocation rate.

[0008] An advantage of the present disclosure may include higher driver satisfaction due to increased driver utilization and revenue.

[0009] These and other aforementioned advantages and features of the aspects herein disclosed will be apparent through reference to the following description and the accompanying drawings. Furthermore, it is to be understood that the features of the various aspects described herein are not mutually exclusive and can exist in various combinations and permutations.

[0010] The present disclosure generally relates to a system for predicting a delivery time for batch orders. The system may include one or more processor(s); and a memory having instructions stored therein, the instructions, when executed by the one or more processor(s), may cause the one or more processor(s) to: determine a first zone for a merchant and a market supply in the first zone; determine one or more second zones for one or more users and a market demand in the one or more second zones, wherein the one or more second zones

surround the first zone; determine an allocation rate based on the market supply and the market demand; determine one or more balance scores for each of the one or more second zones, wherein the one or more balance scores indicate likelihoods of drivers receiving another job after a first job of delivering an item from the first zone to the one or more second zones; and determine the asymmetric merchant visibility based on the allocation rate and the one or more balance scores.

[0011] According to an embodiment, the first zone may be a supply zone and the one or more second zones may be at least one of a demand zone or a mixed zone, wherein the mixed zone may be both a second demand zone and a second supply zone.

[0012] According to an embodiment, when the allocation rate indicates an oversupply, users in both the demand zone and the mixed zone may be able to order from the first zone.

[0013] According to an embodiment, when the allocation rate indicates an undersupply, users in the demand zone may not be able to order from the first zone and users in the mixed zone may be able to order from the first zone.

[0014] According to an embodiment, the one or more balance scores for each of the one or more second zones may be determined based on a number of orders from users and a number of orders to merchants for each of the one or more second zones.

[0015] According to an embodiment, the one or more balance scores for each of the one or more second zones may be determined based on historical long-term demand and supply values, historical short-term demand and supply values and real-time demand and supply values.

[0016] According to an embodiment, the one or more balance scores for each of the one or more second zones may be determined based on a first weight on the historical long-term demand and supply values, a second weight on the historical short-term demand and supply values and a third weight on the real-time demand and supply values.

[0017] According to an embodiment, the one or more processor(s) may be configured to determine a balance score for the first zone. The one or more processor(s) may be configured to determine a total balance score based on the balance score of the first zone and the one or more balance scores for each of the one or more second zones.

[0018] According to an embodiment, the one or more processor(s) may be configured to determine the asymmetric merchant visibility based on the total balance score.

[0019] The present disclosure generally relates to a method for method for determining asymmetric merchant visibility. The method may include using one or more processor(s) to: determine a first zone for a merchant and a market supply in the first zone; determine one or more second zones for one or more users and a market demand in the one or more second zones, wherein the one or more second zones surrounds the first zone; determine an allocation rate based on the market supply and the market demand; determine one or more balance scores for each of the one or more second zones, wherein the one or more balance scores indicate likelihoods of drivers receiving another job after a first job of delivering an item from the first zone to the one or more second zones; and determine the asymmetric merchant visibility based on the allocation rate and the one or more balance scores.

[0020] According to an embodiment, the first zone may be a supply zone and the one or more second zones may be at least one of a demand zone or a mixed zone, wherein the mixed zone may be both a second demand zone and a second supply zone.

[0021] According to an embodiment, when the allocation rate indicates an oversupply, users in both the demand zone and the mixed zone may be able to order from the first zone.

[0022] According to an embodiment, when the allocation rate indicates an undersupply, users in the demand zone may not be able to order from the first zone and users in the mixed zone may be able to order from the first zone.

[0023] According to an embodiment, the one or more balance scores for each of the one or more second zones may be determined based on a number of orders from users and a number of orders to merchants for each of the one or more second zones.

[0024] According to an embodiment, the one or more balance scores for each of the one or more second zones may be determined based on historical long-term demand and supply values, historical short-term demand and supply values and real-time demand and supply values.

[0025] According to an embodiment, the one or more balance scores for each of the one or more second zones may be determined based on a first weight on the historical long-term demand and supply values, a second weight on the historical short-term demand and supply values and a third weight on the real-time demand and supply values.

[0026] According to an embodiment, the one or more processor(s) may be configured to determine a balance score for the first zone. The one or more processor(s) may be configured to determine a total balance score based on the balance score of the first zone and the one or more balance scores for each of the one or more second zones.

[0027] According to an embodiment, the one or more processor(s) may be configured to determine the asymmetric merchant visibility based on the total balance score.

[0028] The present disclosure generally relates to a non-transitory computer-readable medium storing computer executable code comprising instructions for determining asymmetric merchant visibility according to the present disclosure.

[0029] The present disclosure generally relates to a computer executable code comprising instructions for determining asymmetric merchant visibility according to the present disclosure.

[0030] To the accomplishment of the foregoing and related ends, the one or more embodiments include the features hereinafter fully described and particularly pointed out in

the claims. The following description and the associated drawings set forth in detail certain illustrative features of the one or more aspects. These features are indicative, however, of but a few of the various ways in which the principles of various aspects may be employed, and this description is intended to include all such aspects and their equivalents.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] In the drawings, like reference characters generally refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the present disclosure. The dimensions of the various features or elements may be arbitrarily expanded or reduced for clarity. In the following description, various aspects of the present disclosure are described with reference to the following drawings, in which:

[0032] FIG. 1 illustrates a system according to various embodiments.

[0033] FIG. 2 shows a flowchart of a method according to various embodiments.

[0034] FIG. 3 illustrates an exemplary illustration of a first zone and one or more second zones according to various embodiments.

[0035] FIG. 4A illustrates an exemplary table of historical demand and supply values according to various embodiments.

[0036] FIG. 4B illustrates an exemplary balance number table for the exemplary table of FIG. 4A according to various embodiments.

[0037] FIG. 4C illustrates an exemplary balance score table for the exemplary table of FIG. 4B according to various embodiments.

[0038] FIG. 4D illustrates an exemplary aggregated balance score table for the exemplary table of FIG. 4C according to various embodiments.

DETAILED DESCRIPTION

[0039] The following detailed description refers to the accompanying drawings that show, by way of illustration, specific details and embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention. Other embodiments may be utilized and structural, and logical changes may be made without departing from the scope of the invention. The various embodiments are not necessarily mutually exclusive, as some embodiments can be combined with one or more other embodiments to form new embodiments.

[0040] Embodiments described in the context of one of the systems or server or methods or computer program are analogously valid for the other systems or server or methods or computer program and vice-versa.

[0041] Features that are described in the context of an embodiment may correspondingly be applicable to the same or similar features in the other embodiments. Features that are described in the context of an embodiment may correspondingly be applicable to the other embodiments, even if not explicitly described in these other embodiments. Furthermore, additions and/or combinations and/or alternatives as described for a feature in the context of an embodiment may correspondingly be applicable to the same or similar feature in the other embodiments.

[0042] The word “exemplary” is used herein to mean “serving as an example, instance, or illustration.” Any embodiment or design described herein as “exemplary” is not necessarily to be construed as preferred or advantageous over other embodiments or designs

[0043] In the context of various embodiments, the articles “a”, “an”, and “the” as used with regard to a feature or element include a reference to one or more of the features or elements.

[0044] As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0045] The terms "at least one" and "one or more" may be understood to include a numerical quantity greater than or equal to one (e.g., one, two, three, four, […], etc.). The term "a plurality" may be understood to include a numerical quantity greater than or equal to two (e.g., two, three, four, five, […], etc.).

[0046] The words "plural" and "multiple" in the description and the claims expressly refer to a quantity greater than one. Accordingly, any phrases explicitly invoking the aforementioned words (e.g. "a plurality of [objects]", "multiple [objects]") referring to a quantity of objects expressly refers more than one of the said objects. The terms "group (of)", "set [of]", "collection (of)", "series (of)", "sequence (of)", "grouping (of)", etc., and the like in the description and in the claims, if any, refer to a quantity equal to or greater than one, i.e. one or more. The terms "proper subset", "reduced subset", and "lesser subset" refer to a subset of a set that is not equal to the set, i.e. a subset of a set that contains less elements than the set.

[0047] The term "data" as used herein may be understood to include information in any suitable analog or digital form, e.g., provided as a file, a portion of a file, a set of files, a signal or stream, a portion of a signal or stream, a set of signals or streams, and the like. Further, the term "data" may also be used to mean a reference to information, e.g., in form of a pointer. The term data, however, is not limited to the aforementioned examples and may take various forms and represent any information as understood in the art.

[0048] The term "processor" or "controller" as, for example, used herein may be understood as any kind of entity that allows handling data, signals, etc. The data, signals, etc. may be handled according to one or more specific functions executed by the processor or controller.

[0049] A processor or a controller may thus be or include an analog circuit, digital circuit, mixed-signal circuit, logic circuit, processor, microprocessor, Central Processing Unit (CPU), Graphics Processing Unit (GPU), Digital Signal Processor (DSP), Field Programmable Gate Array (FPGA), integrated circuit, Application Specific Integrated Circuit (ASIC), etc., or any combination thereof. Any other kind of implementation of the respective functions, which will be described below in further detail, may also be understood as a processor, controller, or logic circuit. It is understood that any two (or more) of the processors, controllers, or logic circuits detailed herein may be realized as a single entity with equivalent functionality or the like, and conversely that any single processor, controller, or logic circuit detailed herein may be realized as two (or more) separate entities with equivalent functionality or the like.

[0050] The term "system" (e.g., a drive system, a position detection system, etc.) detailed herein may be understood as a set of interacting elements, the elements may be, by way of example and not of limitation, one or more mechanical components, one or more electrical components, one or more instructions (e.g., encoded in storage media), one or more controllers, etc.

[0051] A "circuit" as user herein is understood as any kind of logic-implementing entity, which may include special-purpose hardware or a processor executing software. A circuit may thus be an analog circuit, digital circuit, mixed-signal circuit, logic circuit, processor, microprocessor, Central Processing Unit ("CPU"), Graphics Processing Unit ("GPU"), Digital Signal Processor ("DSP"), Field Programmable Gate Array ("FPGA"), integrated circuit, Application Specific Integrated Circuit ("ASIC"), etc., or any combination thereof. Any other kind of implementation of the respective functions which will be described below in further detail may also be understood as a "circuit." It is understood that any two (or more) of the circuits detailed herein may be realized as a single circuit with substantially equivalent functionality, and conversely that any single circuit detailed herein may be realized as two

(or more) separate circuits with substantially equivalent functionality. Additionally, references to a "circuit" may refer to two or more circuits that collectively form a single circuit.

[0052] As used herein, "memory" may be understood as a non-transitory computer-readable medium in which data or information can be stored for retrieval. References to "memory" included herein may thus be understood as referring to volatile or non-volatile memory, including random access memory ("RAM"), read-only memory ("ROM"), flash memory, solid-state storage, magnetic tape, hard disk drive, optical drive, etc., or any combination thereof. Furthermore, it is appreciated that registers, shift registers, processor registers, data buffers, etc., are also embraced herein by the term memory. It is appreciated that a single component referred to as "memory" or "a memory" may be composed of more than one different type of memory, and thus may refer to a collective component including one or more types of memory. It is readily understood that any single memory component may be separated into multiple collectively equivalent memory components, and vice versa. Furthermore, while memory may be depicted as separate from one or more other components (such as in the drawings), it is understood that memory may be integrated within another component, such as on a common integrated chip.

[0053] The following detailed description refers to the accompanying drawings that show, by way of illustration, specific details and aspects in which the present disclosure may be practiced. These aspects are described in sufficient detail to enable those skilled in the art to practice the present disclosure. Various aspects are provided for the present system, and various aspects are provided for the methods. It will be understood that the basic properties of the system also hold for the methods and vice versa. Other aspects may be utilized and structural, and logical changes may be made without departing from the scope of the present

disclosure. The various aspects are not necessarily mutually exclusive, as some aspects can be combined with one or more other aspects to form new aspects.

[0054] To more readily understand and put into practical effect, the present system, method, and other particular aspects will now be described by way of examples and not limitations, and with reference to the figures. For the sake of brevity, duplicate descriptions of features and properties may be omitted.

[0055] It will be understood that any property described herein for a specific system or device may also hold for any system or device described herein. It will also be understood that any property described herein for a specific method may hold for any of the methods described herein. Furthermore, it will be understood that for any device, system, or method described herein, not necessarily all the components or operations described will be enclosed in the device, system, or method, but only some (but not all) components or operations may be enclosed.

[0056] The term "comprising" shall be understood to have a broad meaning similar to the term "including" and will be understood to imply the inclusion of a stated integer or operation or group of integers or operations but not the exclusion of any other integer or operation or group of integers or operations. This definition also applies to variations on the term "comprising" such as "comprise" and "comprises".

[0057] The term "coupled" (or "connected") herein may be understood as electrically coupled or as mechanically coupled, e.g., attached or fixed or attached, or just in contact without any fixation, and it will be understood that both direct coupling or indirect coupling (in other words: coupling without direct contact) may be provided.

[0058] FIG. 1 illustrates a system 100 according to various embodiments.

[0059] According to various embodiments, the system 100 may include a server 110, a first user device 120 and/or a second user device 140.

[0060] In various embodiments, the server 110, the first user device 120 and the second user device 140 may be in communication with each other through communication network 130. In an embodiment, even though FIG. 1 shows a line connecting the server 110 to the communication network 130, a line connecting the first user device 120 and the second user device 140 to the communication network 130, the server 110, and the first user device 120 or the second user device 140 may not be physically connected to each other, for example through a cable. In an embodiment, the server 110, the first user device 120 and the second user device 140 may be able to communicate wirelessly through communication network 130 by internet communication protocols or through a mobile cellular communication network.

[0061] In various embodiments, the server 110 may be a single server as illustrated schematically in FIG. 1, or have the functionality performed by the server 110 distributed across multiple server components. In an embodiment, the server 110 may include one or more server processor(s) 112. In an embodiment, the various functions performed by the server 110 may be carried out across the one or more server processor(s). In an embodiment, each specific function of the various functions performed by the server 110 may be carried out by specific server processor(s) of the one or more server processor(s).

[0062] In an embodiment, the server 110 may include a memory 114. In an embodiment, the server 110 may also include a database. In an embodiment, the memory 114 and the database may be one component or may be separate components. In an embodiment, the memory 114 of the server may include computer executable code defining the functionality that the server 110 carries out under control of the one or more server processor 112. In an embodiment, the database and/or memory 114 may include historical data such as number of orders from users and/or number of orders to merchants for each zone. The historical data may also include historical long-term demand and/or supply values, historical short-term demand and/or supply values and/or real-time demand and supply values.

[0063] According to various embodiments, a computer program product may store the computer executable code including instructions for determining asymmetric merchant visibility according to the various embodiments. In an embodiment, the computer executable code may be a computer program. In an embodiment, the computer program product may be a non-transitory computer-readable medium. In an embodiment, the computer program product may be in the system 100 and/or the server 110.

[0064] In some embodiments, the server 110 may also include an input and/or output module allowing the server 110 to communicate over the communication network 130. In an embodiment, the server 110 may also include a user interface for user control of the server 110. In an embodiment, the user interface may include, for example, computing peripheral devices such as display monitors, user input devices, for example, touchscreen devices and computer keyboards.

[0065] In an embodiment, the first user device 120 may include a user device memory 122. In an embodiment, the first user device 120 may include a first user device processor 124. In an embodiment, the first user device memory 122 may include computer executable code defining the functionality the first user device 120 carries out under control of the first user device processor 124. In an embodiment, the first user device memory 122 may include or may be a computer program product such as a non-transitory computer-readable medium.

[0066] In an embodiment, the first user device 120 may also include an input and/or output module allowing the first user device 120 to communicate over the communication network 130. In an embodiment, the first user device 120 may also include a user interface for the user to control the first user device 120. In an embodiment, the user interface may be a touch panel display. In an embodiment, the user interface may include a display monitor, a keyboard or buttons.

[0067] In an embodiment, the second user device 140 may include a second user device memory 142. In an embodiment, the second user device 140 may include a second user device processor 144. In an embodiment, the second user device 140 may be similar to the first user device 120. For the sake of brevity, duplicate descriptions of features and properties of the second user device 140 is omitted.

[0068] In an embodiment, the system 100 may be used for determining asymmetric merchant visibility. In an embodiment, the processor 112 may be configured to determine a first zone for a merchant. The first zone may be in or may be a first geohash. The term "geohash" may be predefined geocoded cells of partitioned areas of a city or country. In various embodiments, the first zone may be a building such as a shopping mall or food centre. In various embodiment, the first zone may be defined based on a predetermined radius or distance.

[0069] In an embodiment, the processor 112 may be configured to determine a market supply in the first zone. The market supply may be a number of orders for items from the merchant in the first zone. The first zone may also include a plurality of other merchants. The market supply may also be a number of orders for items from one or more merchants in the first zone. The first zone may be a supply zone.

[0070] In an embodiment, the processor 112 may be configured to determine one or more second zones for one or more users. The one or more second zones may be in or may be one or more second geohash. In various embodiments, each second zone in the one or more second zones may be a defined area such as a housing estate or office buildings or a predefined neighbourhood. In various embodiment, each second zone may be defined based on a predetermined radius or distance. The one or more users may be located in the one or more second zones.

[0071] In an embodiment, the processor 112 may be configured to determine a market demand in the one or more second zones. The market demand may be a number of orders for items from the merchant by one or more users in the one or more second zones. The one or more second zones may surround the first zone or may be on the peripheral of the first zone. The one or more second zones may at least one of a demand zone or a mixed zone. The mixed zone may be both a second demand zone and a second supply zone.

[0072] In an embodiment, the processor 112 may be configured to determine an allocation rate based on the market supply and the market demand. The allocation rate may indicate a likelihood of a user order matching or being accepted by a merchant.

[0073] In an embodiment, the processor 112 may be configured to determine one or more balance scores for each of the one or more second zones. The one or more balance scores may indicate likelihoods of drivers receiving another job after a first job of delivering an item from the first zone to the one or more second zones

[0074] In an embodiment, the processor 112 may be configured to determine the asymmetric merchant visibility based on the allocation rate and the one or more balance scores.

[0075] In an embodiment, when the allocation rate indicates an oversupply, users in both the demand zone and the mixed zone may be able to order from the first zone.

[0076] In an embodiment, when the allocation rate indicates an undersupply, users in the demand zone may not able to order from the first zone and users in the mixed zone may able to order from the first zone.

[0077] In an embodiment, the one or more balance scores for each of the one or more second zones may be determined based on a number of orders from users and a number of orders to merchants for each of the one or more second zones.

[0078] In an embodiment, the one or more balance scores for each of the one or more second zones may be determined based on historical long-term demand and supply values, historical short-term demand and supply values and real-time demand and supply values.

[0079] In an embodiment, the one or more balance scores for each of the one or more second zones may be determined based on a first weight on the historical long-term demand and supply values, a second weight on the historical short-term demand and supply values and a third weight on the real-time demand and supply values.

[0080] In an embodiment, the processor 112 may be configured to determine a balance score for the first zone. The one or more processor(s) may be configured to determine a total balance score based on the balance score of the first zone and the one or more balance scores for each of the one or more second zones.

[0081] In an embodiment, the processor 112 may be configured to determine the asymmetric merchant visibility based on the total balance score.

[0082] In an embodiment, an asymmetric merchant visibility control methodology may be used to optimize the driver utilization and revenue in a global and long term manner. In an embodiment, the processor 112 may use each zone's supply and demand information, as well as the number of orders to the merchant to estimate the zone's opportunity cost to the whole instant delivery system, which is then applied to construct the delivery span.

[0083] In an embodiment, there may be a system or a model to estimate the zone demand and supply and calculate the balance score (ie.e., supply/demand balance score), which may indicate the opportunity cost based on historical and/or real time demand and/or supply, and/or the batching information.

[0084] In an embodiment, there may be a system or a model to estimate the deliver efficiency of each zone based on the zone distance, and/or supply/demand balance score and/or the batching information.

[0085] In an embodiment, there may be a system or an algorithm to dynamically compute asymmetric merchant visibility control based on the market status (confirmed allocation signal) and deliver efficiency of each zone.

[0086] FIG. 2 shows a flowchart of a method 200 according to various embodiments.

[0087] According to various embodiments, the method 200 for determining asymmetric merchant visibility may be provided. In some embodiments, the method 200 may include a step 202 of using one or more processor(s) of a system (e.g., the system 100) to determine a first zone for a merchant and a market supply in the first zone. In an embodiment, the method 200 may include a step 204 of using the one or more processor(s) to determine one or more second zones for one or more users and a market demand in the one or more second zones. The one or more second zones may surround the first zone. In an embodiment, the method 200 may include a step 206 of using the one or more processor(s) to determine an allocation rate based on the market supply and the market demand. In an embodiment, the method 200 may include a step 208 of using the one or more processor(s) to determine one or more balance scores for each of the one or more second zones. The one or more balance scores may indicate likelihoods of drivers receiving another job after a first job of delivering an item from the first zone to the one or more second zones. In an embodiment, the method 200 may include a step 210 of using the one or more processor(s) to determine the asymmetric merchant visibility based on the allocation rate and the one or more balance scores.

[0088] Steps 202 to 210 are shown in a specific order, however other arrangements are possible, for example, in some embodiments, step 206 may be carried out after step 202. Steps may also be combined in some cases. Any suitable order of steps 202 to 210 may be used.

[0089] FIG. 3 illustrates an exemplary illustration of a first zone and one or more second zones according to various embodiments.

[0090] In an embodiment, an area 300 (i.e., a city) may be divided into small zones for example via clustering algorithms. The small zones may be determined based on density and/or information of supply and/or demand. With the supply and/or demand information, the small zones may be clustered or categorized into demand zones, supply zones and mixed zones. The categories of zones can be changed in real time with the demand and supply changing. In an embodiment, a first zone may be a supply zone. One or more second zones may be at least one of: a demand zone or a mixed zone. The one or more second zones may surround, or may be near the first zone. In an embodiment, each zone has a balance score.

[0091] In the example shown in FIG. 3, the area 300 has a supply zone 302, a first demand zone 304 (i.e., zone 1), a second demand zone 306 (i.e., zone 2), a mixed zone 308 (i.e., zone 3), and a third demand zone 310 (i.e., zone 4). The supply zone may be considered as the first zone. The first demand zone 304 (i.e., zone 1), the second demand zone 306 (i.e., zone 2), the mixed zone 308 (i.e., zone 3), and the third demand zone 310 (i.e., zone 4) may be considered as the one or more second zones.

[0092] In an embodiment, after the zones are defined, for each merchant, the quantity of demands in history can be determined by analyzing the historical orders. In an embodiment, historical data from historical orders may include an average and/or median number of orders being placed to the merchant historically, based on the time of day, and/or whether the day is a weekday or a weekend. Similar demand numbers for the nearby merchants may be determined if nearby merchant order batching is conducted.

[0093] With the demand information, a table may be generated to show the relationship between the merchant and linked zones. For example, FIG. 3 shows one merchant in the supply zone 302, with four linked zones 204, 306, 308 310 that have orders being placed to the merchant.

[0094] With the known demand and supply information, the merchant visibility control may be applied based on the allocation health of the areas. Allocation health of a certain area at any given moment may be estimated by real-time signal of Confirmed Allocation Rate (CAR), which is defined by the following formulae:

[0095] $$CAR = \frac{\#orders\ allocated\ in\ the\ past\ 10\ minutes}{(\#orders\ started\ allocation\ in\ past\ 10\ mins + \#orders\ created\ in\ previous\ time\ blocks\ that\ are\ unallocated)}$$

[0096] Based on the CAR signal, the market supply and demand can be categorized into several levels, such as oversupply (e.g., CAR>0.9), slightly under supply (e.g., 0.9≥CAR>0.75), under supply (e.g., 0.75≥CAR>0.5), and extremely under supply (e.g., CAR<0.5) when the driver supply is extremely low while the demand is extremely high, such as the peak hour in downtown areas.

[0097] When the market is in oversupply, the users in all the surrounding zones 304, 306, 308, 310 may order food from the merchant in the supply zone 302, as the driver supply is enough, the focus may be to increase the overall number of orders, and thus increase a Gross Merchant Value (GMV).

[0098] When the market is in slightly undersupply condition, the users from a further zone e.g., the third demand zone 310, may be removed since the further zone may have fewer orders (e.g., 3 orders) from users from the merchant in the supply zone 302. As the number of orders from the further zone to the merchant may be low, thus the batching probability for all users in the further zone may also be also low.

[0099] When the market is in undersupply condition, the users from a nearby zone with less orders e.g., the first demand zone 304 with 3 orders, may be removed although it is near to the supply zone 302, as the demand is much lesser than the further away zones (e.g., zones

306, 308) as the orders in the further away zones with higher orders may have a higher chance to be batched than the nearer one, thus have higher driver utilization efficiency.

[00100] When the market is under extremely undersupply conditions, if the distance and demand from two zones are similar, the users from a demand zone (e.g., zone 306) may be removed and the users from a mixed zone (e.g., zone 308) may be able to continue purchasing from the merchant in supply zone 302. In the demand zone, after the driver completes the job, there will be a very low chance to get another job near the zone, which means the driver needs to go back to the supply zone without an order on hand, thus lowering the system efficiency. For the mixed zone, the likelihood of the driver getting another job near the mixed zone is higher thus improving the system efficiency.

[00101] In an embodiment, the problem may be expressed as a linear function of one or more of: the merchant distance, zone properties of demand and supply, and number of orders from merchants within the zone. The formula can be expressed as:

$S_{zone} = \alpha \times d_{merchant} + \beta \times s_{balance} + \gamma \times n_{orders}$.

[00102] In an embodiment, S_{zone} may be the selection score of a particular zone to a merchant or a group of nearby merchants. The higher the score, the higher chance the merchant may be accessible from the zone when the driver supply market is in undersupply condition.

[00103] In an embodiment, $d_{merchant}$ may the distance between (e.g., the central point of) a particular zone to the merchant or a group of nearby merchants.

[00104] In an embodiment, $s_{balance}$ may be the balance score calculated based on the number of orders created by eaters and the number of orders processed by merchants within one zone. The higher number of orders processed by merchants, the higher the score, which may indicate that the driver in that zone has a higher chance to get a job. The lower score may mean the chance of the driver in the zone to get another job is lower.

[00105] In an embodiment, n_{orders} may indicate the number of orders created for a specific merchant or a group of merchants from the zone. The higher the number may mean the chance of two or more orders being batched is higher. Otherwise, the batch probability may be lower.

[00106] In an embodiment, coefficients α, β and γ can be estimated based on the driver time spent or saved on traveling, detour, batching time efficiency, and time saved by getting another job in the dropped zone or zones nearby drop location. These three coefficients may be estimated and optimised based on a learning algorithm, which may tune the parameters with real time performance metrics and market conditions.

[00107] In an embodiment, to get the balance score of a zone, the historical order balance and the balance of surrounding zones may need to be considered. For example, the number of orders created by users and/or number of orders processed by merchants may be used. The number of orders may be based on the day of week, and/or time slot of day in a long period of time (e.g. one month) and short period of time (e.g. one week). In an embodiment, values (i.e., current values) for a previous time slot in the current day may be obtained. The time slot can be defined by users, such as 15mins, 30mins or 1 hour based on the changing frequency of these variables and the CAR signal.

[00108] With calculated long term, short term and current values of number of orders created and the number of orders processed in the zone, the number of balance may be: $n_{balance} = (n_{eater} - n_{merchan})$, where n_{eater} is the number of orders created by users (i.e., eaters) in the zone, $n_{merchant}$ is the number of orders processed by merchants in the zone. A range of score may be between [-0.5, 0.5].

[00109] The formula for $s_{balance}(t)$ may be $s_{balance}(t) = (max(n_{balance}) - n_{balance})/(max(n_{balance}) - min(n_{balance})) - 0.5$, where $s_{balance}(t)$ may stand for

balance score, which may a normalized value based on the maximum balance and the minimum balance.

[00110] The formula for $s_{balance}(zone)$ may be $s_{balance}(zone) = a \times s_{balance}(long) + b \times s_{balance}(short) + c \times s_{balance}(current)$, where $s_{balance}(zone)$ may stand for the overall balance score of a zone, which may combine the long term historical score, short term historical score and current score.

[00111] In an embodiment, $s_{balance}(long)$ may be the long term balance score, which may be aggregated based on the long term data (e.g., past one month data) for that slot of time. $s_{balance}(short)$ may be the balance score for the short term data (e.g., past one week data) for that specific slot of time. $s_{balance}(current)$ may be the score value for the previous time slot, which may represent the current market conditions. Coefficients a, b and c are the coefficients for the values, which can be tuned based on a learning model.

[00112] In an embodiment, with the balance score of each zone, the final balance score $s_{balance}$ may be calculated. The balance scores of nearby zones and the zone itself may be interpolated. For example if a zone itself is a demand zone, but if most of the surrounding zones are supply zones with higher balance score, this zone may be considered as a supply (surplus) zone, as the driver is still able to find another job easily in the surrounding zones after the driver completes the allocated job. The formula may be:

$s_{balance} = \sum_{i\ in\ zones} \frac{s_{balance}(zone_i)}{u(d_{zone_i})}$, where: d_{zone_i} may be the unified distance between the zone itself and the nearby zone, $i\ in\ zones$ may be the zone itself and the set of zones nearby the zone, $u(d_{zone_i})$ may be the unified distance based on predefined unified step, for instance, 500m.

[00113] FIG. 4A illustrates an exemplary table 400 of historical demand and supply values according to various embodiments.

[00114] Table 400 may include a zone name 402, long term user orders 404, long term orders for merchants 406, short term user orders 408, short term orders for merchants 412, current user orders 414, current orders for merchants 416, and distance 418. Under the zone name 402, there may be a supply zone 420 (zone A), and one or more zones near supply zone 420. The one or more zones may include a first zone 422A, a second zone 422B, a third zone 422C, a fourth zone 422D and a fifth zone 422E. The distance 418 may include information regarding the distance from the one or more zones 422A-E to the supply zone 420.

[00115] FIG. 4B illustrates an exemplary balance number table 425 for the exemplary table 400 of FIG. 4A according to various embodiments.

[00116] Based on the long term user orders 404, the long term orders for merchants 406, a long term balance number 426 may be obtained. The long term balance number 426 may be obtained by substracting the long term orders for merchants 406 from the long term user orders 404.

[00117] Based on the short term user orders 408, the short term orders for merchants 412, a short term balance number 428 may be obtained. The short term balance number 428 may be obtained by substracting the short term orders for merchants 412 from the short term user orders 408.

[00118] Based on the current user orders 414, the current orders for merchants 416, a current balance number 430 may be obtained. The current balance number 430 may be obtained by substracting the current orders for merchants 416 from the current user orders 414.

[00119] In an embodiment, a negative number indicates that the zone may be a demand zone and a postive number may indicate that the zone may be a supply zone.

[00120] FIG. 4C illustrates an exemplary balance score table 450 for the exemplary table 425 of FIG. 4B according to various embodiments

[00121] In table 450, a long term balance score 432, a short term balance score 434 and a current balance score 436 may be calculated based on a maximum and a minimum balance number around merchants. For example, max(long) = 200, min(long) = -200, max(short) = 50, min(short)=-50, max(current)=20 and min(current)= -20.

[00122] FIG. 4D illustrates an exemplary aggregated balance score table 475 for the exemplary table 450 of FIG. 4C according to various embodiments.

[00123] In table 475, each of the long term, short term and current balance scores may be aggregated based on coefficients for long term, short term and current term balance scores. For example, the coefficients for long term, short term and current term balance scores may be 0.2, 0.3 and 0.5 respectively.

[00124] In an embodiment, before a final score is calculated, the distance 418 may be unified based on a predefined coefficient. For example, 0.5 km may be used as a base step and a value for zone A may be 1, then the unified distance to zone A will be 1, 2, 3, 4, 3, and 2 Then the final balance score for zone A is: -0.265 + 0.2975/2 + 0.0675/3 + 0.0675/4 + (-0.0675/3) + (-0.0275/2) = -0.113125. Thus, the balance score for zone A is -0.113125, which may be considered as a demand zone.

[00125] In an embodiment, to get the number of orders created by users (eaters) in a zone to a specific merchant or group of nearby merchants. The similar mechanism is used as the balance score calculation. The numbers of orders in the long-term, short-term and current period may be aggregated. Different weightages may be given to the long-term, short-term and current period to estimate the number of orders being created in a time slot. Based on the number of orders created, a batching probability of orders from the zone may be estimated.

[00126] In an embodiment, after the score of zone (S_{zone}) is calculated, the scores of all the possible zones surrounding the merchant may be normalized. The CAR signal may be used to indicate the driver supply condition. By combining the CAR signal and the normalized

score: $normalized(S_{zon}\ ) > \lambda_x(1 - CAR)$, a decision may be made. In an embodiment, if the CAR is high, more zones can visit the merchant, while if the CAR is low, the users (eaters) from the zones with lower score will be temporarily stopped to create orders to the merchant. λ_x may be used in the formula to give weight for specific merchants. For instance, higher λ_x may be given for the partner merchants and/or the high GMV merchants, while lower λ_x may be given to the low performance merchants, such as the merchants with long waiting time, and/or high cancellation rate.

[00127] In the following, various examples of this disclosure are illustrated:

[00128] Example 1 is a system for determining asymmetric merchant visibility, the system comprising: one or more processor(s); and a memory having instructions stored therein, the instructions, when executed by the one or more processor(s), cause the one or more processor(s) to: determine a first zone for a merchant and a market supply in the first zone; determine one or more second zones for one or more users and a market demand in the one or more second zones, wherein the one or more second zones surround the first zone; determine an allocation rate based on the market supply and the market demand; determine one or more balance scores for each of the one or more second zones, wherein the one or more balance scores indicate likelihoods of drivers receiving another job after a first job of delivering an item from the first zone to the one or more second zones; and determine the asymmetric merchant visibility based on the allocation rate and the one or more balance scores.

[00129] Example 2 is the system of Example 1, wherein the first zone is a supply zone and the one or more second zones is at least one of a demand zone or a mixed zone, wherein the mixed zone is both a second demand zone and a second supply zone.

[00130] Example 3 is the system of Example 2, wherein when the allocation rate indicates an oversupply, users in both the demand zone and the mixed zone are able to order from the first zone.

[00131] Example 4 is the system of Example 2, wherein when the allocation rate indicates an undersupply, users in the demand zone are not able to order from the first zone and users in the mixed zone are able to order from the first zone.

[00132] Example 5 is the system of any one of Examples 1-4, wherein the one or more balance scores for each of the one or more second zones are determined based on a number of orders from users and a number of orders to merchants for each of the one or more second zones.

[00133] Example 6 is the system of any one of Examples 1-5, wherein the one or more balance scores for each of the one or more second zones are determined based on historical long-term demand and supply values, historical short-term demand and supply values and real-time demand and supply values.

[00134] Example 7 is the system of Example 6, wherein the one or more balance scores for each of the one or more second zones are determined based on a first weight on the historical long-term demand and supply values, a second weight on the historical short-term demand and supply values and a third weight on the real-time demand and supply values.

[00135] Example 8 is the system of any one of Examples 1-7, wherein the one or more processor(s) is configured to determine a balance score for the first zone, and configured to determine a total balance score based on the balance score of the first zone and the one or more balance scores for each of the one or more second zones.

[00136] Example 9 is the system of Example 8, wherein the one or more processor(s) is configured to determine the asymmetric merchant visibility based on the total balance score.

[00137] Example 10 is a method for determining asymmetric merchant visibility, the method comprising using one or more processor(s) to: determine a first zone for a merchant and a market supply in the first zone; determine one or more second zones for one or more users and a market demand in the one or more second zones, wherein the one or more second zones surrounds the first zone; determine an allocation rate based on the market supply and the market demand; determine one or more balance scores for each of the one or more second zones, wherein the one or more balance scores indicate likelihoods of drivers receiving another job after a first job of delivering an item from the first zone to the one or more second zones; and determine the asymmetric merchant visibility based on the allocation rate and the one or more balance scores.

[00138] Example 11 is the method of Example 10, wherein the first zone is a supply zone and the one or more second zones is at least one of a demand zone or a mixed zone, wherein the mixed zone is both a second demand zone and a second supply zone.

[00139] Example 12 is the method of Example 11, wherein when the allocation rate indicates an oversupply, users in both the demand zone and the mixed zone are able to order from the first zone.

[00140] Example 13 is the method of Example 11, wherein when the allocation rate indicates an undersupply, users in the demand zone are not able to order from the first zone and users in the mixed zone are able to order from the first zone.

[00141] Example 14 is the method of any one of Examples 10-13, wherein the one or more balance scores for each of the one or more second zones are determined based on a number of orders from users and a number of orders to merchants for each of the one or more second zones.

[00142] Example 15 is the method of any one of Examples 10-14, wherein the one or more balance scores for each of the one or more second zones are determined based on

historical long-term demand and supply values, historical short-term demand and supply values and real-time demand and supply values.

[00143] Example 16 is the method of Example 15, wherein the one or more balance scores for each of the one or more second zones are determined based on a first weight on the historical long-term demand and supply values, a second weight on the historical short-term demand and supply values and a third weight on the real-time demand and supply values.

[00144] Example 17 is the method of any one of Examples 10-16, wherein the one or more processor(s) is configured to determine a balance score for the first zone, and configured to determine a total balance score based on the balance score of the first zone and the one or more balance scores for each of the one or more second zones.

[00145] Example 18 is the method of Example 17, wherein the one or more processor(s) is configured to determine the asymmetric merchant visibility based on the total balance score.

[00146] Example 19 is a non-transitory computer-readable medium storing computer executable code comprising instructions for determining asymmetric merchant visibility according to any one of Examples 1 to 18.

[00147] Example 20 is a computer executable code comprising instructions for determining asymmetric merchant visibility according to any one of Examples 1 to 19.

[00148] While the present disclosure has been particularly shown and described with reference to specific aspects, it should be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the scope of the present disclosure as defined by the appended claims. The scope of the present disclosure is thus indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced.

CLAIMS

What is claimed is:

1. A system for determining asymmetric merchant visibility, the system comprising:

one or more processors; and

a memory having instructions stored therein, the instructions, when executed by the one or more processors, cause the one or more processors to:

determine a first zone for a merchant and a market supply in the first zone;

determine one or more second zones for one or more users and a market demand in the one or more second zones, wherein the one or more second zones surround the first zone;

determine an allocation rate based on the market supply and the market demand;

determine one or more balance scores for each of the one or more second zones, wherein the one or more balance scores indicate likelihoods of drivers receiving another job after a first job of delivering an item from the first zone to the one or more second zones, wherein the one or more balance scores for each of the one or more second zones are determined based on historical long-term demand and supply values, historical short-term demand and supply values, real-time demand and supply values, and a distance from the each of the one or more second zones to the first zone; and

determine the asymmetric merchant visibility based on the allocation rate and the one or more balance scores.

2. The system of claim 1, wherein the first zone is a supply zone and the one or more second zones is at least one of a demand zone or a mixed zone, wherein the mixed zone is both a second demand zone and a second supply zone.

3. The system of claim 2, wherein when the allocation rate indicates an oversupply, users in both the demand zone and the mixed zone are able to order from the first zone.

4. The system of claim 2, wherein when the allocation rate indicates an undersupply, users in the demand zone are not able to order from the first zone and users in the mixed zone are able to order from the first zone.

5. The system of any one of claims 1-4, wherein the one or more balance scores for each of the one or more second zones are determined based on a number of orders from users and a number of orders to merchants for each of the one or more second zones.

6. The system of any one of claims 1-5, wherein the distance is unified based on a predefined coefficient, to determine the one or more balance scores for each of the one or more second zones.

7. The system of any one of claims 1-6, wherein the one or more balance scores for each of the one or more second zones are determined based on a first weight on the historical long-term demand and supply values, a second weight on the historical short-term demand and supply values and a third weight on the real-time demand and supply values.

8. The system of any one of claims 1-7, wherein the one or more processors are configured to determine a balance score for the first zone, and configured to determine a total balance score based on the balance score of the first zone and the one or more balance scores for each of the one or more second zones.

9. The system of claim 8, wherein the one or more processors are configured to determine the asymmetric merchant visibility based on the total balance score.

10. A method for determining asymmetric merchant visibility, the method comprising using one or more processors to:

determine a first zone for a merchant and a market supply in the first zone;

determine one or more second zones for one or more users and a market demand in the one or more second zones, wherein the one or more second zones surrounds the first zone;

determine an allocation rate based on the market supply and the market demand;

determine one or more balance scores for each of the one or more second zones, wherein the one or more balance scores indicate likelihoods of drivers receiving another job after a first job of delivering an item from the first zone to the one or more second zones, wherein the one or more balance scores for each of the one or more second zones are determined based on historical long-term demand and supply values, historical short-term demand and supply values, real-time demand and supply values, and a distance from the each of the one or more second zones to the first zone; and

determine the asymmetric merchant visibility based on the allocation rate and the one or more balance scores.

11. The method of claim 10, wherein the first zone is a supply zone and the one or more second zones is at least one of a demand zone or a mixed zone, wherein the mixed zone is both a second demand zone and a second supply zone.

12. The method of claim 11, wherein when the allocation rate indicates an oversupply, users in both the demand zone and the mixed zone are able to order from the first zone.

13. The method of claim 11, wherein when the allocation rate indicates an undersupply, users in the demand zone are not able to order from the first zone and users in the mixed zone are able to order from the first zone.

14. The method of any one of claims 10-13, wherein the one or more balance scores for each of the one or more second zones are determined based on a number of orders from users and a number of orders to merchants for each of the one or more second zones.

15. The method of any one of claims 10-14, wherein the distance is unified based on a predefined coefficient, to determine the one or more balance scores for each of the one or more second zones.

16. The method of any one of claims 10-15, wherein the one or more balance scores for each of the one or more second zones are determined based on a first weight on the historical long-term demand and supply values, a second weight on the historical short-term demand and supply values and a third weight on the real-time demand and supply values.

17. The method of any one of claims 10-16, wherein the one or more processors are configured to determine a balance score for the first zone, and configured to determine a total balance score based on the balance score of the first zone and the one or more balance scores for each of the one or more second zones.

18. The method of claim 17, wherein the one or more processors are configured to determine the asymmetric merchant visibility based on the total balance score.

19. A non-transitory computer-readable medium storing computer executable code comprising instructions for causing one or more processors to carry out a method for determining asymmetric merchant visibility according to any one of claims 10 to 18.

20. A computer executable code comprising instructions for causing one or more processors to carry out a method for determining asymmetric merchant visibility according to any one of claims 10 to 18.