Pricing Airline Optional Services

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ABSTRACT

A pricing system receives a request for a price of one or more optional services for a flight. The pricing system determines, for each ATPCO S5 record (“S5 record”) associated with each corresponding requested optional service, whether the S5 record comprises a formula table. If the pricing system determines that the S5 record does not comprise a formula table, the pricing system identifies ATPCO S7 records (“S7 record”) associated with the S5 record and sequentially evaluates pricing conditions stipulated by each of the S7 records until finding a first S7 record comprising a pricing condition that is satisfied by the flight information, passenger information, or other information. In another example, if the pricing system determines that an S5 record for a requested optional service comprises a formula table, the pricing system identifies one or more S5 record identifiers in the formula table identifying pricing tables comprising an S5 record and its associated list of S7 records. The pricing system extracts the S5 records of pricing tables and the associated list of S7 records for each pricing table identified by the S5 record identifiers and determines a price for each of the pricing tables identified in the formula table by sequentially evaluating pricing conditions stipulated by each of the S7 records until finding a first S7 record comprising a pricing condition that is satisfied by the flight information, passenger information, and/or other information. The pricing system determines a price for the requested service by evaluating the formula in the formula table comprising one or more numerical constants, the determined price for each of the pricing tables, and one or more mathematical operators. The pricing system returns a price or a fail result for each of the requested optional services based on the prices determined either from S5 records and associated S7 records (if applicable) or from S5 records comprising formula tables and associated S5 pricing tables including the associated S7 records.

BACKGROUND

In the airline industry, optional services are services or products offered by an airline in addition to the principal service of transportation. Examples of optional services comprise seating in an extra-legroom seat, early or priority boarding, access to a lounge at an airport, a special in-flight meal, or an upgrade of cabin class. Conventionally, airlines configure prices...
for optional services by analyzing supply and demand and determining pricing conditions, which list a price for an optional service if a specific combination of factors is satisfied such as an origin, destination, distance of destination from origin, age of passenger, time of departure, time of arrival, duration of flight, type of plane, operating airline, number of passengers travelling together, quantity sold of the requested optional service type, total number of the requested optional service type, and/or other factors. Airlines may transmit lists of thousands of possible pricing conditions for optional services to a pricing system in a standard format, such as a format prescribed by the Airline Tariff Publishing Company (“ATPCO”). The pricing system analyzes, for a requested optional service, each pricing condition in a list of pricing conditions until finding a first particular pricing condition in which all factors are satisfied by flight information, passenger information, or other information associated with the flight with which the optional service request is associated. Conventional pricing systems do not enable an airline to develop simple pricing rules for optional services that are expressed in simple mathematical functions that modify a base price of an optional service that are transparent and understandable to consumers and expressed in simple mathematical functions. Conventional pricing systems also do not allow an airline to develop pricing conditions for optional services that comprise custom factors.

OVERVIEW

The examples described herein provide computer-implemented techniques to determining prices for optional services related to flights. In an example embodiment, an airline system or airline staff associated with the airline system transmits a list of conditions to a pricing system.

In an example embodiment, the airline system generates a sub code services record for each optional service that the airline system provides. In an example, the sub code services record comprises an “S5 record” in accordance with a format prescribed by the Airline Tariff Publishing Company (“ATPCO”). Example optional services comprise being seated in an extra legroom seat, early or priority boarding, extra checked bags, in flight meals, in flight snacks, in flight beverages, other in flight purchases, or other optional services that an airline offers in addition to the service of transportation. The sub code
services record may stipulate a name of the optional service, taxes associated with the service, directions for how the optional service is listed on a ticket or boarding pass, and other relevant information.

An example sub code services record (S5 record) comprises a list of associated provisions records defining pricing conditions for the optional service associated with the sub code services record. A provisions record may comprise an “S7 record” in accordance with a format prescribed by the ATPCO. The airline system generates provisions records associated with each sub code services record defining pricing conditions for an optional service associated with the sub code services record. In this example, each provision record defines a particular pricing condition for the optional service defined by the sub code services record. In one example, a pricing condition for an optional service comprises a set of sub-conditions and a price associated with the condition if the set of sub-conditions are satisfied. Example sub-conditions within pricing conditions may comprise a time of a flight, an origin of a flight, a flight number range, a day of the week, a destination of a flight, a departure time, an arrival time, a type or model of airplane, an airline carrier name, and any other sub-condition that the airline wants as a requirement for the price in the pricing condition.

In conventional pricing systems, a pricing system retrieves a sub code services record (S5 record) for a requested optional service for a flight and then sequentially reviews all provisions records (S7 records) associated with that particular S5 record for the requested optional service until finding a first S7 record comprising an applicable pricing condition. For example, multiple S7 records associated with a particular S5 record may have pricing conditions that are satisfied by the flight information, however, the pricing system selects the first applicable S7 record from the multiple S7 records and determines the price of the requested optional service based on the price stipulated by the pricing condition in the first applicable S7 record. For example, a first S7 record comprising a first pricing condition stipulates, “if origin is Atlanta, departure is after 5:00 a.m., departure is before 11:00 a.m., flight number is in range of 0-600, then price is $50,” a second S7 record comprising a second pricing condition stipulates, “if origin is Boston, departure is after 5:00 a.m., departure is before 10:00 a.m., flight number is in range of 0-950, then price is $30” and a third S7 record comprising a third pricing condition stipulates, “if origin is Boston, departure
is after 8:00 a.m., departure is before 11:00 a.m., flight number is in range of 0-950, then price is $15.” In this example, the flight associated with the requested optional service associated with the S5 record departs 9:50 a.m. from Boston and comprises a flight number of 550. In this example, the pricing system first reviews the first S7 record comprising the first pricing condition and finds the first pricing condition inapplicable. In this example, in response to finding the first pricing condition associated with the first S7 record inapplicable, the pricing system then reviews the second S7 record comprising the second pricing condition. In this example, the pricing system determines that the second pricing condition in the second S7 record is applicable based on the flight information and determines the price stipulated in the pricing condition of the second S7 record as the price of the requested optional service. In this example, even though both the second pricing condition and the third pricing condition are applicable to the flight information, the pricing system would review the second S7 record comprising the second pricing condition and would find the second pricing condition of the first S7 record applicable and would then not review any further S7 records, including the third S7 record comprising the third pricing condition.

In the present invention, a pricing system receives a request for a price of one or more optional services for a flight. The pricing system determines, for each S5 record associated with each corresponding requested optional service, whether the S5 record comprises a formula table. If the pricing system determines that the S5 record does not comprise a formula table, the pricing system identifies S7 records associated with the S5 record and sequentially evaluates pricing conditions stipulated by each of the S7 records until finding a first S7 record comprising a pricing condition that is satisfied by the flight information, passenger information, or other information associated with the flight. In another example, if the pricing system determines that an S5 record for a requested optional service comprises a formula table, the pricing system identifies one or more S5 record identifiers in the formula table identifying pricing tables. The pricing system extracts the S5 records of pricing tables identified by the S5 record identifiers and determines a price for each of the pricing tables identified in the formula table based on the flight information and/or user information by evaluating all S7 records associated with that particular S5 record for the requested optional service until finding a first S7 record comprising an applicable pricing condition. The pricing
system determines a price for the requested service by evaluating the formula in the formula table comprising one or more numerical constants, the determined price for each of the pricing tables, and one or more mathematical operators. The pricing system returns a price or a fail result for each of the requested optional services based on the prices determined either from S5 records and associated S7 records (if applicable) or from S5 records comprising formula tables and associated S5 pricing tables. In some examples, S5 records comprising formula tables may comprise formulas referencing other S5 records that comprise formula tables and associated lists of S7 records.

EXAMPLE PROCESSES AND ARCHITECTURE

With reference to Figure 1, an optional service pricing system will be described.

In an example, an airline system generates sub code services records (S5 records) comprising formula tables and sub code services records (S5 records) comprising pricing tables comprising a list of S7 records associated with each respective S5 record, each S5 record comprising a pricing table associated with one or more S5 records comprising formula tables. For example, one or more airline staff associated with the airline system generate the S5 records via a user interface of a computing device that communicates with the pricing system over a network. A formula table may specify a mathematical function defining a price for an optional service associated with a particular sub code service record (S5 record) as a function of prices determined from one or more sub code service records (S5 records) comprising pricing tables. The formula may comprise, numerical constants, currency amount constants, sub code service record (S5 record) identifiers associated with pricing tables, and mathematical operators. Example mathematical operators may comprise nullary, unary, and/or binary operators. For example, the formula table may comprise one or more of the operators of addition, subtraction, multiplication, division, average, mean, median, minimum, maximum, various kinds of rounding operations, or other appropriate operators. For example, a formula comprises “(P1 + P2)*P3” where P1, P2, and P3 comprise S5 record identifiers associated with S5 records comprising pricing tables P1, P2, and P3. For example, if P1, P2, and P3 are S5 record identifiers associated with pricing tables P1, P2, and P3, and the S5 record comprises the formula ((P1+P2)*P3), where the price determined from pricing
table P1=50, the price determined from pricing table P2=$10, and the price determined from pricing table P3=0.90, the calculated price of the service is $54. The airline system may generate one or more S5 records comprising pricing tables for use with a formula defined in the formula table of an S5 record.

In an example, the airline system may include additional information in existing S7 records associated with S5 records such as including additional custom criteria to pricing conditions specified by S7 records. Example criteria may be numerical, a string, or a list of strings. An example criterion comprises a key, a specific condition to be evaluated, a match value to evaluate against, and a scope of applicability of the value. For example, the key specifies particular data that is used by the pricing system in the pricing query for ancillary services. Example conditions comprise mathematical operators such as less than, greater than, equal to or other conditions. The scope of applicability may be a complete journey, a segment of a journey, or a particular passenger of a flight. An example criterion comprises a key of “customer score,” a condition of “greater than,” a match value of “25,” and a scope of “passenger.” In this example, the criterion specifies that for the condition to be applicable, the customer score of the passenger must be greater than 25. In an example, this custom criterion specifying that the customer score of the passenger must be greater than 25 may be added to an existing S7 record specifying standard criteria such as departure airport, arrival airport, time of flight, or other standard conditions.

In an example embodiment, the pricing system receives a request for a price of an optional service for a flight. In an example, a consumer or an agent accesses a website associated with the pricing system or otherwise communicates with the pricing system via a user computing device to submit a request for a price of an optional service for a flight. In an example, the pricing system determines an S5 record associated with the requested optional service. The optional service may be one or more of early boarding for a flight, an extra-legroom seat, an in-flight meal, extra checked luggage, or other optional service other than transportation. In another example, the pricing system receives a request for prices of multiple optional services for a flight and the pricing system determines an S5 record associated with each of the requested optional services. The pricing system determines, for
each S5 record associated with each corresponding requested optional service, whether the S5 record comprises a formula table.

If the pricing system determines that the S5 record does not comprise a formula table, the pricing system identifies S7 records associated with the S5 record and sequentially evaluates pricing conditions stipulated by each of the S7 records until finding a first S7 record comprising a pricing condition that is satisfied by the flight information. As previously discussed, one or more operators or staff associated with the airline system may create S7 records associated with S5 records by adding additional criteria to pricing conditions specified by S7 records. In an example, the request for one or more optional services further comprises definitions for one or more keys and one or more associated match values and associated scopes of applicability that may be utilized to evaluate pricing conditions specified by S7 records. As previously discussed, a modified S7 record comprises a criterion comprising a key, a specific condition to be evaluated, a match value to evaluate against, and a scope of applicability of the value. For example, the key specifies a source of data. Example conditions comprise mathematical operators such as less than, greater than, equal to or other conditions. The scope of applicability may be a complete journey or a segment or a passenger. An example criterion comprises a key of “customer score,” a condition of “greater than,” a match value of “25,” and a scope of “passenger.” In this example, the criterion specifies that for the condition to be applicable, the customer score of the passenger must be greater than 25. As part of evaluating an S7 record, the custom criterion is evaluated along with standard criteria in addition to the custom criterion. In an example, the pricing system may receive customer data and may use the customer data in evaluating pricing condition S7 records comprising custom criteria.

In another example, if the pricing system determines that an S5 record for a requested optional service comprises a formula table, the pricing system identifies one or more S5 record identifiers in the formula table identifying pricing tables. The pricing system extracts the S5 records of pricing tables identified by the S5 record identifiers in the formula table and determines a price for each of the pricing tables identified in the formula table based on the flight information and/or user information. A pricing table P1 may stipulate “customer under 65 years old returns 10, customer equal to or over 65 years old returns 5,” a pricing table P2
may stipulate “departure between 5 p.m. and 11 p.m. returns 10, departure between 11 p.m. and 5 a.m. returns 15, and departure between 5 a.m. and 5 p.m. returns 55,” and a pricing table P3 may stipulate “customer is a veteran? yes returns 90%, no returns 100%.” In this example, if the formula table comprises “(P1 + P2)*P3” where P1, P2, and P3 comprise S5 record identifiers associated with the S5 records comprising pricing tables described previously, the P1 pricing table gives a $5 discount to senior citizens and the P3 pricing table gives a 10% discount to veterans after any senior citizen discount of P1 is applied according to the order of operations of the formula. The pricing system determines a price for the requested service by evaluating the formula in the formula table comprising one or more numerical constants, the determined price for each of the pricing tables, and one or more mathematical operators. For example, if the user is a senior citizen and veteran and the flight departs at 7 a.m. and the S5 record comprises the formula ((P1+P2)*P3), where P1=5, P2=55, and P3=90% according to the pricing tables discussed previously, the calculated price of the optional service is (5+55)*90% = 54. In another example, a pricing table determines that a customer is not qualified for a service and determines a “fail” result. For example, a pricing table P1 associated with a formula table in an S5 record for an optional service of alcoholic beverages stipulates “under 21 years old = FAIL, 21-55 years old = 1, and over 55 years old = 90%.” For example, a pricing table P2 associated with a formula table in an S5 record for an optional service of an inflight move service stipulates “airplane model A = 1, airplane model X = 1.5, and airplane model Z = FAIL.” In an example, when the pricing system determines a fail result on any pricing table referenced by a formula table for an optional service, the pricing returns a fail result for the optional service indicating that the customer is not eligible for the optional service and/or the optional service is not available on the flight associated with the optional service request.

The pricing system returns a price or a fail result for each of the requested optional services based on the prices determined either from S5 records and associated S7 records (if applicable) or from S5 records comprising formula tables and associated S5 pricing tables, each of the associated S5 pricing tables associated with a respective list of S7 records or including a formula table. For example, an S5 record may either be associated with a list of S7 records, or may comprise a formula table. In an example, the prices for the one or more
requested optional services are returned to a flight search system along with flight search results. In an example, the pricing system may communicate or display the price for a requested optional service along with a formula described in the formula table of the S5 record associated with the requested optional service and one or more prices from pricing tables referenced by the formula table. For example, the pricing system communicates or displays “Early boarding $54 = (flight departing between 5 a.m. and 5 p.m. = $60 - senior citizen discount $5) x 90% [10% veterans discount]” explaining to the customer that the base price is $60 for early boarding but customer qualified for a five dollar senior citizen discount from the base price and for a 10% veteran’s discount, resulting in a price of $54 for early boarding for the flight associated with the optional service request. In another example, the pricing system communicates or displays the adjusted price with an explanation comprising “Early boarding $54, senior citizen discount and veterans discounts apply.” In another example, the pricing system communicates or displays a fail result and a reason for the fail result for a requested optional service. For example, the pricing system communicates a message reading “Customer does not qualify for alcohol service because customer is less than 21 years of age” to the user computing device or to the user computing device.

By using and relying on the methods and systems described herein, the pricing system and one or more airline systems provide an improvement to price calculation for optional services. Incorporating formula tables into sub code services records (S5 records) and enabling the addition of custom-defined criteria into provisions records (S7 records) may reduce the processing required by the pricing system to determine pricing for optional services, simplify pricing calculations for airline systems and the pricing system, provide for the specification of additional types of pricing conditions by airlines, and provide transparent explanations for prices that are easy to understand by agents and consumers and that provide an easier method to manage pricing conditions.