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(54) OPTIMIZATION OF LAUNDRY CYCLES UTILIZING USER FEEDBACK

(71) Applicant: **Haier US Appliance Solutions, Inc.**, Wilmington, DE (US)

(72) Inventors: **Joshua Reeves**, Louisville, KY (US); **Ryan James Scheckelhoff**, Louisville, KY (US)

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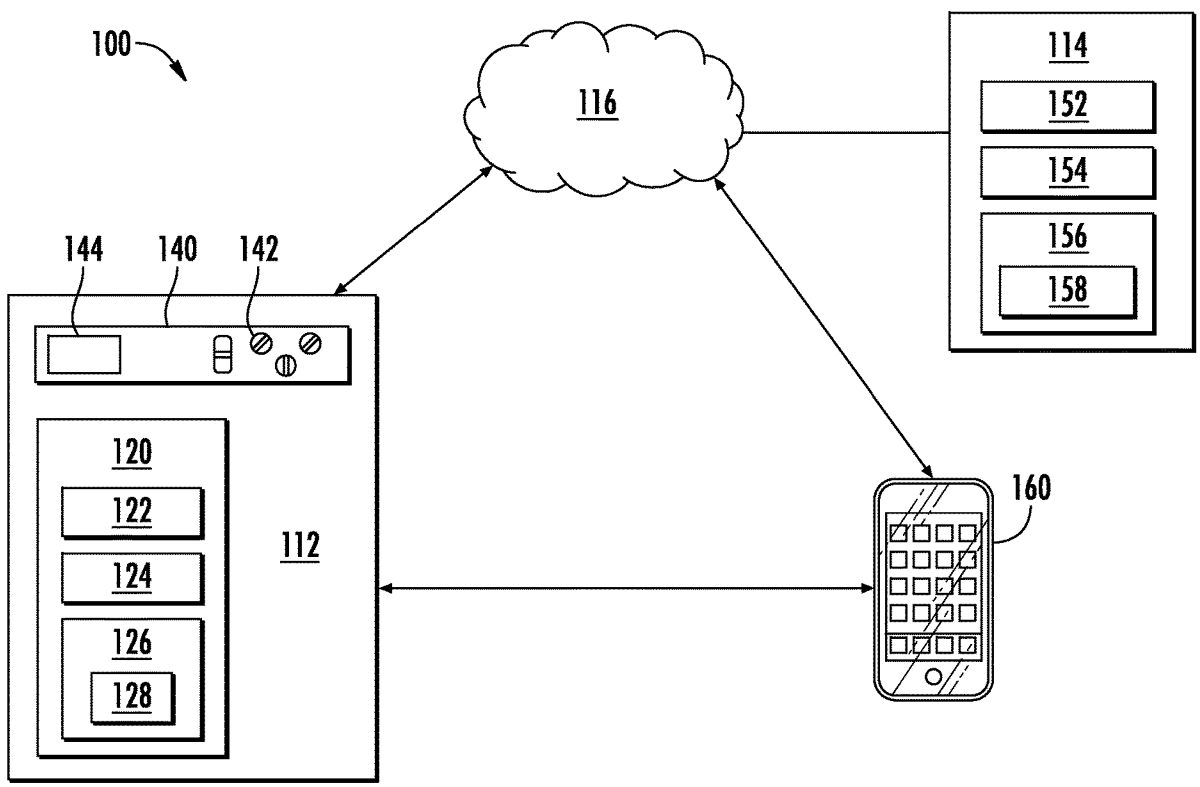
(57) **ABSTRACT**

A method of operating a laundry treatment appliance includes performing a selected laundry treatment operation on a laundry load in accordance with an original set of operating parameters, obtaining a feedback input from a user regarding a dryness level of the laundry load, adjusting at least one operating parameter of the original set of operating parameters, and generating a new set of operating parameters including the at least one adjusted operating parameter.



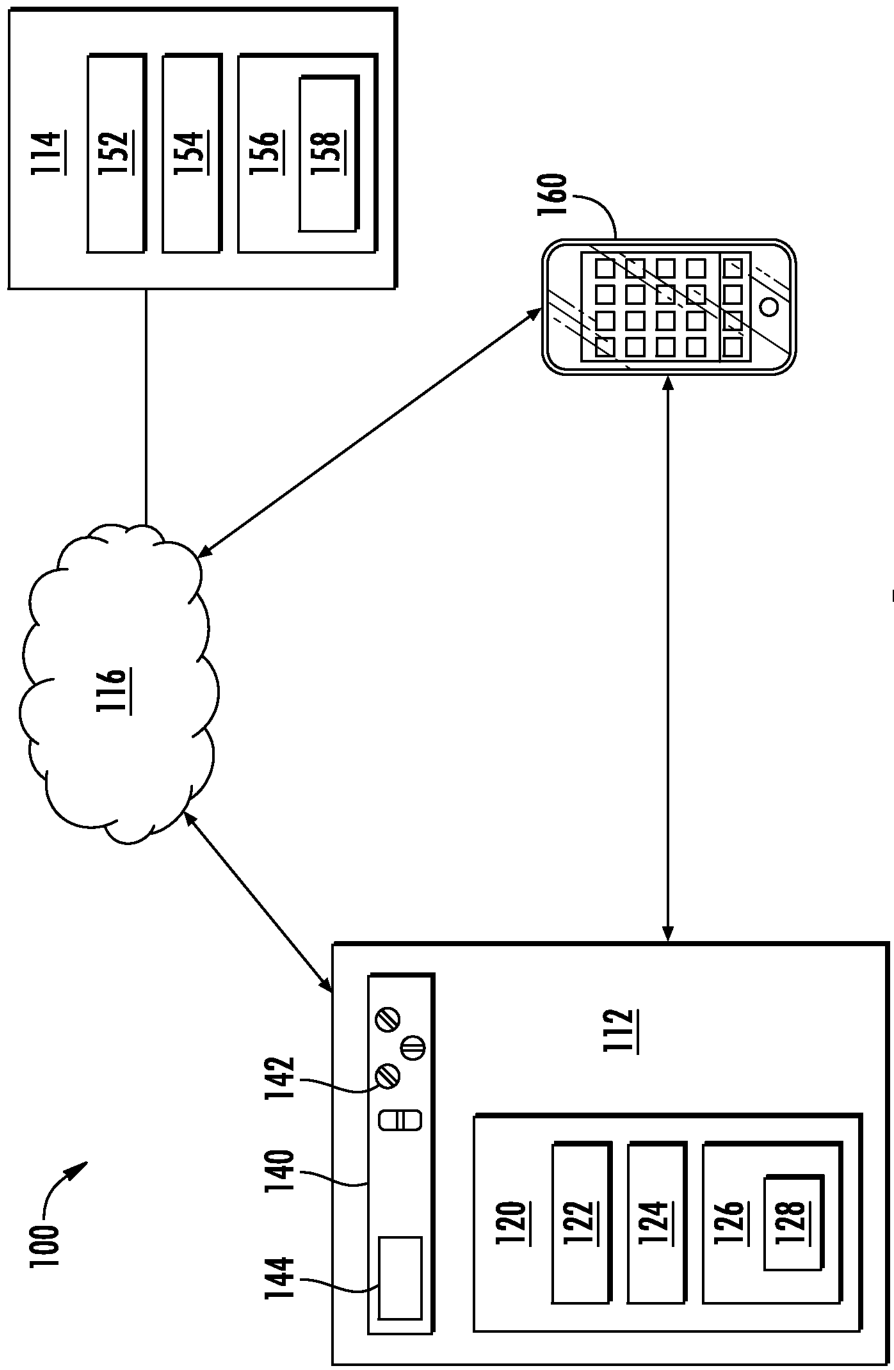

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FIG. 1

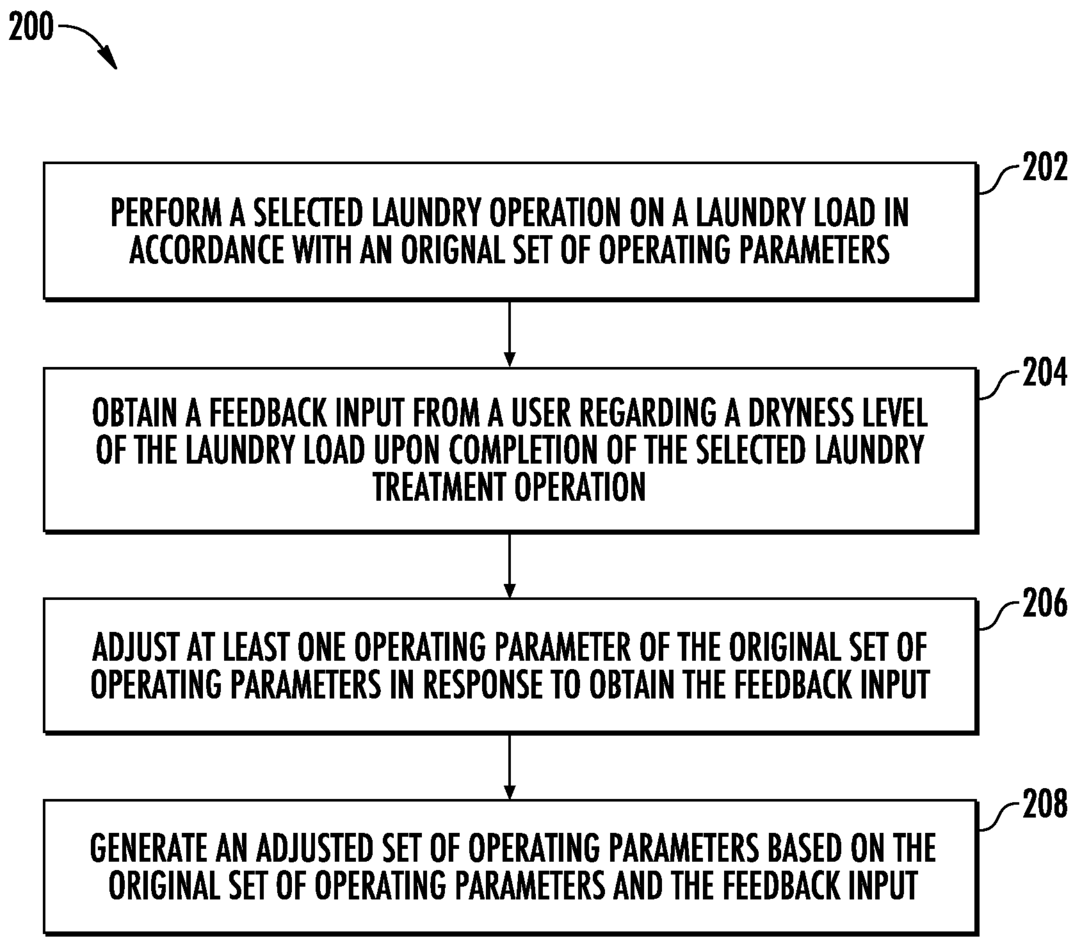
200
PERFORM A SELECTED LAUNDRY OPERATION ON A LAUNDRY LOAD IN ACCORDANCE WITH AN ORIGNAL SET OF OPERATING PARAMETERS
202
OBTAIN A FEEDBACK INPUT FROM A USER REGARDING A DRYNESS LEVEL OF THE LAUNDRY LOAD UPON COMPLETION OF THE SELECTED LAUNDRY TREATMENT OPERATION
204
ADJUST AT LEAST ONE OPERATING PARAMETER OF THE ORIGINAL SET OF OPERATING PARAMETERS IN RESPONSE TO OBTAIN THE FEEDBACK INPUT
206
GENERATE AN ADJUSTED SET OF OPERATING PARAMETERS BASED ON THE ORIGINAL SET OF OPERATING PARAMETERS AND THE FEEDBACK INPUT
208

FIG. 2

OPTIMIZATION OF LAUNDRY CYCLES UTILIZING USER FEEDBACK

FIELD OF THE INVENTION

[0001] The present subject matter relates generally to laundry treatment appliances, and more particularly to optimizing subsequent operating cycles of laundry treatment appliances based on user feedback.

BACKGROUND OF THE INVENTION

[0002] Conventional consumer appliances typically operate in an open-ended manner. In this regard, all appliance settings and control inputs are set prior to beginning an operating cycle. The operating cycle is then performed based solely on the pre-cycle input, and the process is repeated during subsequent operating cycles.

[0003] However, conventional appliances fail to incorporate appliance performance during prior operating cycles as a means to improve performance during subsequent operating cycles. Operation and performance of consumer appliances may be improved by using feedback from the appliance. In failing to consider the results of prior operating cycles, conventional appliances fail to optimize appliance performance during subsequent cycles. For instance, laundry treatment appliances (such as dryers, for example) may continually under perform with regards to user expectancies, resulting in dissatisfaction and user annoyance.

[0004] Accordingly, a method for improving appliance performance by incorporating closed loop feedback from an appliance operating cycle to make appliance adjustments for subsequent operating cycles would be useful. More particularly, a method incorporating performance data and consumer feedback regarding the operation of a laundry treatment appliance during subsequent operating cycles would be especially beneficial.

BRIEF DESCRIPTION OF THE INVENTION

[0005] Aspects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention.

[0006] In one exemplary aspect of the present disclosure, a method of optimizing performance of a laundry treatment appliance is provided. The method may include performing a selected laundry treatment operation on a laundry load in accordance with an original set of operating parameters; obtaining a feedback input from a user regarding a dryness level of the laundry load upon completion of the selected laundry treatment operation; adjusting at least one operating parameter of the original set of operating parameters in response to obtaining the feedback input; and generating an adjusted set of operating parameters based on the original set of operating parameters and the feedback input.

[0007] In another exemplary aspect of the present disclosure, a laundry treatment appliance is disclosed. The laundry treatment appliance may include a cabinet forming a receiving space; a tub rotatably provided within the receiving space; and a controller operably coupled to the tub, the controller being configured to perform a series of operations. The series of operations may include performing a selected laundry treatment operation on a laundry load in accordance with an original set of operating parameters; obtaining a feedback input from a user regarding a dryness level of the laundry load upon completion of the selected laundry treatment operation; adjusting at least one operating parameter of the original set of operating parameters in response to obtaining the feedback input; and generating an adjusted set of operating parameters comprising the at least one adjusted operating parameter.

[0008] These and other features, aspects and advantages of the present invention will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended figures.

[0010] FIG. **1** is a schematic diagram of a system for providing cycle-based consumer feedback and control of a consumer appliance according to an exemplary embodiment of the present subject matter.

[0011] FIG. **2** illustrates a method for optimizing the performance of an appliance according to an exemplary embodiment of the present disclosure.

[0012] Repeat use of reference characters in the present specification and drawings is intended to represent the same or analogous features or elements of the present invention.

DETAILED DESCRIPTION

[0013] Reference now will be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope of the invention. For instance, features illustrated or described as part of one embodiment can be used with another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

[0014] FIG. **1** provides a schematic diagram of a system **100** for providing cycle-based consumer feedback and control of one or more consumer appliances (e.g., a laundry treatment appliance) according to an exemplary embodiment of the present subject matter. In general, system **100** may include one or more appliances, e.g., appliance **112**, that are communicatively coupled with a remote server **114** through a network **116**, as described in detail below. Although a single appliance **112** is used herein as an exemplary embodiment to describe aspects of the present subject matter, one skilled in the art will appreciate that more than one appliance may be used in system **100** and that other appliances and systems may incorporate aspects of the present subject matter and remain within the scope of the invention.

[0015] According to the illustrated embodiment of FIG. **1**, appliance **112** may include a controller **120**. Various components of exemplary controller **120** are illustrated in schematic fashion in FIG. **1**. As shown, controller **120** may include one or more processor(s) **122** and associated memory device(s) **124** configured to perform a variety of computer-implemented functions (e.g., performing the methods, steps, and the like disclosed herein). By way of example, processor **122** may include one or more microprocessors, such as general or special purpose microprocessors operable to execute programming instructions or micro-control code associated with an operating cycle. Memory **124** may represent random access memory such as DRAM, or read only memory such as ROM or FLASH. In one embodiment, processor **122** executes programming instructions stored in memory **124**. Memory **124** may be a separate component from processor **122** or may be included onboard within processor **122**.

[0016] Additionally, controller **120** may also include a communications module **126** to facilitate communications between controller **120** and various other components of system **100**. For instance, the communications module **126** may serve as an interface to permit controller **120** to transmit and/or receive from remote server **114** performance data related to operating cycles, as discussed herein. Moreover, the communications module **126** may include an interface **128** (e.g., one or more analog-to-digital converters) to permit input signals to be converted into signals that can be understood and processed by the processor **122**.

[0017] Controller **120** may be positioned in a variety of locations throughout appliance **112**. In the exemplary embodiment illustrated in FIG. **1**, controller **120** may be located proximate a user interface panel **140** of appliance **112**. In such an embodiment, input/output ("I/O") signals may be routed between the controller **120** and various operational components of appliance **112** along wiring harnesses that may be routed through a cabinet of appliance **112**. Typically, controller **120** is in communication with user interface panel **140**, which may represent a general purpose I/O ("GPIO") device or functional block. According to an exemplary embodiment, user interface **140** may include controls **142** through which a user may select various operational features and modes of appliance **112**. In one embodiment, controls **142** may include one or more of a variety of electrical, mechanical, or electro-mechanical input devices including rotary dials, push buttons, and touch pads. User interface **140** may also include a display component, such as a digital or analog display device **144** designed to provide operational feedback to a user and allow for monitoring the progress of an operating cycle.

[0018] User interface **140** may be in communication with controller **120** via one or more signal lines or shared communication busses. Controller **120** may also be communication with one or more sensors to monitor the operation of appliance **112**. For example, according to an exemplary embodiment, appliance **112** may be a laundry machine, and sensors may include temperature sensors to measure water temperature, humidity sensors to detect a dryness of a washing load (e.g., within a dryer appliance), water level gauges, vibration sensors to measure out-of-balance conditions, and other sensors for measuring and monitoring an operating cycle of appliance **112**. In this manner, controller **120** may operate appliance **112** in response to user manipulation of user interface panel **140** and can also receive performance feedback from sensors placed throughout appliance **112**. In addition, performance data or cycle status indicators may be indicated to the user with display **144**.

[0019] As mentioned above, system **100** may further include remote server **114**. Remote server **114** may generally operate to store, receive, and transmit signals associated with operating cycles, such as performance data, and may thus be in communication with appliance **112** through controller **120**. For example, remote server **114** may include one or more processor(s) **152** and associated memory device(s) **154** configured to perform a variety of computer-implemented functions (e.g., performing the methods, steps, and the like disclosed herein). By way of example, processor **152** may include one or more microprocessors, such as general or special purpose microprocessors operable to execute programming instructions or micro-control code associated with an operating cycle. Memory **154** may represent random access memory such as DRAM, or read only memory such as ROM or FLASH. In one embodiment, processor **152** executes programming instructions stored in memory **154**. Memory **154** may be a separate component from processor **152** or may be included onboard within processor **152**.

[0020] Additionally, the remote server **114** may also include a communications module **156** to facilitate communications between the remote server **114** and controller **120** and various other components of the system **100**, such as a user input device **160**, as discussed below. For instance, the communications module **156** may serve as an interface to permit the remote server **114** to transmit and/or receive performance data associated with operating cycles and recommendations for improving operating cycles. Moreover, the communications module **156** may include an interface **158** (e.g., one or more analog-to-digital converters) to permit input signals to be converted into signals that can be understood and processed by the processor **152**.

[0021] Server **114** may be remote, and thus external to appliance **112** which is typically located at a single location, e.g., a consumer's residence. The server **114** may, for example, be in another room of a house or building in which the system **100** is utilized, or in a neighboring building, etc. Alternatively, and in exemplary embodiments, the remote server **114** is a cloud-based server **114**, and is thus located at a distant location, such as in a separate state, country, etc. The remote server **114** may be in wireless communication with the appliance **112** (and controller **120**), such as through a network **116**. The network **116** may be any type of wireless communications network, such as a local area network (e.g. intranet), wide area network (e.g. Internet), or some combination thereof. The network **116** can also include a direct connection between the client devices, such as appliance **112**, as discussed herein, and the remote server **114**. In general, communication between the remote server **114** and the client devices may be carried via a network interface using any type of wireless connection, using a variety of communication protocols (e.g. TCP/IP, HTTP, SMTP, FTP), encodings or formats (e.g. HTML, XML), and/or protection schemes (e.g. VPN, secure HTTP, SSL). Accordingly, operating cycle and status information may be transmitted from controller **120** to the remote server **114** using the network **116**.

[0022] System **100** may further include user input device **160** that may be configured for receiving user input regarding the performance of the operating cycle and transmitting the user input to remote server **114**. According to an exemplary embodiment, user input device **160** may be a mobile phone or tablet that is in wireless communication with network **116** and remote server **114**. Alternatively, user input device **160** may be a personal computer, may be a dedicated input terminal on appliance **112**, may be a module within user interface **140** of appliance **112**, or may be any other device suitable for receiving feedback from a user and transmitting that feedback to remote server **114**. In addition, user input device **160** may be used to communicate directly with appliance **112**, for example, to adjust appliance settings or receive performance data.

[0023] As shown in FIG. **1**, user input device **160** may be a mobile phone having a software application for inputting feedback and transmitting the feedback to remote server **114**. The feedback may be solicited by the application in certain circumstances, such as by pop-up indicators or requests, seeking that the user provides feedback to specific cycles or perform some action to rectify a fault condition with appliance **112**. Alternatively, the user feedback may be initiated by the user by launching the application when it is desirable to provide feedback, such as when an issue has occurred, or system performance is not satisfactory to the user.

[0024] As will be understood by those skilled in the art, appliance **112** illustrated in FIG. **1** is provided only for the purpose of explanation and is not intended to limit the scope of the present subject matter. Aspects of the present subject matter may be used with any suitable number and type of appliances and it should be appreciated that the invention is not limited to any particular style, model, or configuration of these appliances. Indeed, the present subject matter may be used with other consumer or commercial appliances, such as, cooking appliances, dishwashers, microwave ovens, refrigerators, etc. In addition, one skilled in the art will appreciate that the schematic diagram shown in FIG. **1** is a simplified representation of the appliances and communication links that may be used to perform certain aspects of the present subject matter. Other components may be used, other configurations are possible, and these variations may be within the scope of the present subject matter.

[0025] Now that the details of system **100** according to an exemplary embodiment of the present subject matter have been presented, an exemplary method **200** of optimizing performance of an appliance by implementing a corrective action based on collected user feedback and performance data will be described. Although the discussion below refers to the exemplary method **200** of operating appliance **112**, one skilled in the art will appreciate that the exemplary method **200** is applicable to the operation of a variety of other appliances and systems, and system **100** is used only for the purpose of explanation. For example, it should be understood that method **200** may be used, for example, for systems incorporating more than one appliance, including cooking appliances, dishwashers, or other suitable consumer or commercial appliances.

[0026] Referring now specifically to FIG. **2**, an exemplary method **200** for improving or optimizing the performance of one or more consumer appliances will be described. In general, FIG. **2** illustrates method **200** for operating an appliance (or a system of appliances) and a remote server, such as system **100**, according to exemplary embodiments of the present subject matter. In particular, method **200** enables closed loop feedback regarding the performance of appliance **112** and provides or implements a recommendation for improving future performance of appliance **112**. To perform method **200** using system **100**, controller **120** may be programmed to perform method **200**, e.g., by collecting performance data and/or user feedback, transmitting the data to a remote server, determining an alteration to an operating parameter, and implementing the adjust operating parameter during a subsequent operating cycle. However, one skilled in the art will appreciate that method **200** may be performed using other systems as well.

[0027] At step **202**, method **200** may include performing a selected laundry operation on a laundry load in accordance with an original set of operating parameters. In detail, according to an exemplary embodiment, the appliance (e.g., appliance **112**) may be a laundry treatment appliance, and specifically a drying appliance. Accordingly, the laundry operation may be a drying operation. The drying operation may be a tumble dry operation incorporating a supply of heated air to a tub or drum. Thus, the laundry operation may operate primarily according to a determined target drying time and a level of heat (or heated air) supplied to the tub (e.g., high, medium, low, off, etc.).

[0028] The original set of operating parameters may be incorporated into a control algorithm, for example. The control algorithm may be a predetermined algorithm accounting for multiple attributes of a laundry load, such as a load size (e.g., weight), a load type (e.g., delicates, cottons, mixed loads, towels, sheets, etc.), a level of heat (e.g., as selected by the user), and, in some embodiments, a preferred dryness level. According to this embodiment, the preferred dryness level is selected by the user prior to initiating the laundry operation from a list of dryness levels. For instance, the preferred dryness level may include damp, less dry, normal, more dry, and extra dry. The user may select one dryness level from the list of dryness levels. It should be noted that some embodiments may incorporate more or fewer options for dryness level to be selected.

[0029] After having selected the laundry load type, heat level, and preferred dryness level (and load size according to some embodiments), the controller may iterate the control algorithm to determine the target drying time. According to at least one embodiment, the control algorithm may incorporate a target time equation for determining the target time. The target time equation may be, for example:

$$\text{Target Time}=([t_{TV_0*\varphi_1}*(M_0*\varphi_2)]+A_0\varphi_3-t_{TV_0})*TM+t_{TV_0}$$

[0030] wherein t_{TV_0} is a time to reach a target moisture score (TV_0 being the target moisture score), M_0 is a multiplier term for altering the time to reach the target moisture score, A_0 is an adder term for adding a predetermined amount of time to the target drying time, TM is a time adjustment factor based on a selected temperature of the selected laundry treatment operation, and φ_1, φ_2, and φ_3 are factors adjusted according to the feedback input.

[0031] As can be seen in the above equation, each term (e.g., the target moisture score, the multiplier term, and the adder term) have an associated factor (e.g., φ_1, φ_2, and φ_3) associated therewith. The factors may be adjusted (as will be explained in more detail below) to subsequently alter the target drying time. For instance, the controller (e.g., controller **120**) may receive feedback, e.g., user feedback, and adjust the target time equation accordingly to generate a new target drying time. Hereinafter, the terms (e.g., the target moisture score, the multiplier term, and the adder term) may be referred to as the operating parameters.

[0032] The controller may also have a minimum cycle time programmed therein. For instance, the minimum cycle time may be a minimum amount of time that the laundry treatment appliance should run for a selected laundry operation. The minimum cycle time may be preprogrammed into the controller or may be set (e.g., by a user or a technician). The minimum cycle time may subsequently be altered in order to accommodate for changing circumstances relating to the laundry treatment appliance, such as air flow, exhaust pressure, motor torque, or due to feedback input from the user (described below). Thus, after calculating the target drying time (e.g., via the target time equation), the controller may compare the calculated target drying time with the stored minimum cycle time. The controller may then select the greater of the two and perform the selected laundry treatment operation. For instance, if the calculated target drying time (e.g., having incorporated feedback) is less than the minimum cycle time, the controller may instruct the laundry treatment appliance to perform the selected laundry treatment operation for the minimum cycle time.

[0033] At step **204**, method **200** may include obtaining a feedback input from a user regarding a perceived dryness level of the laundry load upon completion of the selected laundry treatment operation. In detail, at the completion of the laundry treatment operation, the appliance may request an input from the user regarding the operation performed. In some embodiments, the request is sent to a mobile device (e.g., user input device **160**). The request may be presented to the user in the form of a sliding scale, for example. The sliding scale may incorporate a plurality of levels of dryness from which the user may choose. For example, five levels of dryness may be presented to the user. The sliding scale may be presented in any suitable format. Additionally or alternatively, the sliding scale may be presented to the user from a user interface (e.g., user interface panel **140**) of the appliance. According to at least one embodiment, the sliding scale includes options such as way too damp, too damp, dry, too dry, and way too dry. It should be noted that more or fewer options my be presented to the user according to specific embodiments.

[0034] The feedback input may be transmitted to a memory device (e.g., memory device **154**). Thus, the memory device may store the feedback input therein for use in adjusting the control algorithm (described below). When the feedback input is received via the mobile device, the feedback input may be transmitted to the appliance, e.g., via a network (e.g., network **116**).

[0035] At step **206**, method **200** may include adjusting at least one operating parameter of the original set of operating parameters in response to obtaining the feedback input. As described above, the target time equation may initially be iterated utilizing standard (or original) operating parameters. In one scenario, a user may select a laundry treatment cycle with a "more dry" option. After performing the laundry treatment cycle, the user may inspect the laundry load and perceive the laundry load to be "too damp." The user may thus provide the feedback input as "too damp" (e.g., via the sliding scale). Accordingly, the controller may incorporate the feedback input into the control algorithm and adjust one or more of the original operating parameters.

[0036] As discussed above, the original operating parameters may include the target moisture score, the multiplier term, and the adder term. The controller may determine which operating parameter (or parameters) to adjust by analyzing the feedback input from the user. In some embodiments, only one operating parameter is adjusted. In other embodiments, two or more operating parameters are adjusted. Referring back to the target time equation, each operating parameter (or term) included a corresponding φ term. Thus, when adjusting the operating parameters, the controller may adjust the corresponding φ term with the selected parameter. Accordingly, the φ terms (e.g., φ_1, φ_2, and φ_3) may be integers incorporated into the target time equation to perform the required adjustments.

[0037] Further, the controller may determine which operating parameter to adjust based on the selected laundry load type. For example, a different operating parameter may be adjusted when the laundry load type is cottons versus when the laundry load type is delicates. In some embodiments, a look-up table is incorporated into the memory device. The look-up table may include a plurality of predetermined φ terms according to a plurality of laundry treatment operation possibilities. The controller may retrieve an associated φ term to adjust the target time equation (and subsequently the control algorithm). Additionally or alternatively, the controller may calculate a φ term from the feedback input, taking into consideration the laundry load type, etc.

[0038] As discussed above, the operating parameters may include the target moisture score, the multiplier term, and the adder term. In detail, the target moisture score may be a predetermined arbitrary score associated with a particular laundry load. In some embodiments, the target moisture score includes a target voltage level, e.g., from one or more sensors provided within the laundry treatment appliance. In some embodiments, the laundry treatment appliance includes a humidity sensor to determine a relative humidity within the tub, thus approximating a dryness level of the laundry load. The adder term may be a positive integer that increases a total laundry treatment operation time by a certain amount. For instance, the adder term may be represented in seconds or minutes. The multiplier term may be a positive integer that increases or decreases the total laundry treatment operation time as a function of the time to the target moisture score. Accordingly, each operating parameter may adjust the target drying time by a different amount on a different scale.

[0039] Moreover, the adjustments made to the operating parameters may be defined as either coarse adjustments or fine adjustments. In detail, a coarse adjustment may incorporate relatively large adjustments to the target drying time, while fine adjustments incorporate relatively smaller adjustments to the target drying time. For example, a large discrepancy between the selected drying level (e.g., "more dry") and the perceived dryness level (e.g., "too damp") may incorporate the coarse adjustment. In some embodiments, the coarse adjustment adjusts two or more of the operating parameters. Additionally or alternatively, the coarse adjustment may be different according to the laundry load type selected by the user. For instance, a coarse adjustment for a delicates laundry load may be different from a coarse adjustment for a towels laundry load (e.g., regarding which term is adjusted). Thus, according to the coarse adjustment, an adjustment of between 3 minutes and 10 minutes may be incorporated into the target drying time. It should be noted that the time adjustment may vary between selected cycles (e.g., between a delicate cycle, a cotton cycle, a towel cycle, etc.).

[0040] For another example, a small discrepancy between the selected drying level (e.g., "more dry") and the perceived dryness level (e.g., "dry") may incorporate a fine adjustment. In some embodiments, the fine adjustment adjusts only one of the operating parameters. Additionally or alternatively, the fine adjustment may be different according to the laundry load type selected by the user. For instance, a fine adjustment for a delicates laundry load may be different from a fine adjustment for a towels laundry load (e.g., regarding which term is adjusted). Thus, according to the fine adjustment, an adjustment of less than 5 minutes may be incorporated into the target drying time. It should be noted that the time adjustment may vary between selected cycles (e.g., between a delicate cycle, a cotton cycle, a towel cycle, etc.).

[0041] At step **208**, method **200** may include generating an adjusted set of operating parameters based on the original set of operating parameters and the feedback input. In detail, upon determining which operating parameters are to be adjusted and in turn adjusting those operating parameters, the controller may incorporate the adjusted set of operating parameters into the target time equation. Accordingly, the control algorithm may be run again to determine the new target drying time.

[0042] The laundry treatment appliance (e.g., the memory device thereof) may store the adjusted set of operating parameters therein. For instance, the adjusted set of operating parameters may be stored in addition to the original set of operating parameters. Moreover, any subsequent adjusted set of operating parameters may be stored in addition to each of the original set of operating parameters and the initial adjusted set of operating parameters. In detail, the memory device may keep track of a history of adjustments made to the target time equation, the control algorithm, the set of operating parameters, and the like. Advantageously, the laundry treatment appliance may continually improve its operating efficiency and performance.

[0043] For instance, the user may subsequently run a similar or identical laundry treatment operation as described above. The controller may incorporate the adjusted set of operating parameters to perform the selected laundry treatment operation according to the adjusted time, in order to produce more accurate results. A subsequent request for feedback input may be presented to the user (e.g., similar to the manner discussed above). The controller may then adjust another operating parameter from the adjusted set of operating parameters in response to receiving the feedback input. It should be noted that the operating parameter adjusted subsequently may or may not be the same operating parameter that was adjusted initially. For instance, the adder term (e.g., the associated φ term) may be adjusted in each of the initial adjustment and the subsequent adjustment. In other embodiments, the adder term (e.g., the associated φ term) may be adjusted in the initial adjustment while the target moisture score (e.g., the associated φ term) is adjusted in the subsequent adjustment.

[0044] The controller (e.g., the memory device) may then store the subsequent adjusted set of operating parameters therein. As would be expected, any future iterations of the target time equation may incorporate each of the adjusted sets of operating parameters to narrowly adjust the operating time of the laundry treatment appliance.

[0045] Further, the controller may determine one or more interruptions to the laundry treatment appliance. For instance, the controller may register a loss of power to the laundry treatment appliance. The loss of power may be the result of the appliance being unplugged and moved to a new location, for example. Additionally or alternatively, the controller may register a new airflow regime associated with the appliance. In detail, the controller may, by use of sensors or calculations, determine that a volume, amount, or pressure of air (e.g., heated air) supplied to the tub may be different from the last time the control algorithm was performed. Thus, external factors may be considered by the controller before executing the target time equation.

[0046] Thus, the controller may reset the adjusted set of operating parameters to the original set of operating parameters in response to the determined interruption. In some embodiments, the controller may present a request to the user to reset the adjusted set of operating parameters. For instance, the request may be presented to the user's mobile device as a prompt. Upon selecting yes, the controller may return the operating parameters (and thus the target time equation) back to its original settings and begin the process over.

[0047] According to the embodiments described herein, an appliance (such as a laundry appliance) may intelligently improve performance (such as drying performance) utilizing user feedback and continued modification of a plurality of operating parameters of a model equation. The appliance may perform a selected operation according to an initial or original set of operating parameters. The appliance may then request a feedback input to determine whether the operation was satisfactorily performed. Utilizing the feedback input, the appliance may adjust one or more parameters of a model equation used to calculate a target time for which to perform the operation. Thus, a new set of parameters may be substituted into the model equation to generate a more accurate operation time, improving results and increasing user satisfaction.

[0048] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they include structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

What is claimed is:

1. A method of optimizing performance of a laundry treatment appliance, the method comprising:

performing a selected laundry treatment operation on a laundry load in accordance with an original set of operating parameters;

obtaining a feedback input from a user regarding a dryness level of the laundry load upon completion of the selected laundry treatment operation;

adjusting at least one operating parameter of the original set of operating parameters in response to obtaining the feedback input; and

generating an adjusted set of operating parameters based on the original set of operating parameters and the feedback input.

2. The method of claim **1**, wherein the original set of operating parameters and the adjusted set of operating parameters are incorporated into a control algorithm, the control algorithm outputting a target time for completing the selected laundry treatment operation.

3. The method of claim **2**, wherein the control algorithm comprises a target time equation for determining the target time for completing the selected laundry treatment operation, the target time equation comprising:

$$\text{Target Time}=([t_{TV_0*\varphi_1}*(M_0*\varphi_2)]+A_0\varphi_3-t_{TV_0})*TM+t_{TV_0}$$

wherein t_{TV_0} is a time to reach a target moisture score;

TV_0 is the target moisture score;

M_0 is a multiplier term for altering the time to reach the target moisture score;

A_0 is an adder term for adding a predetermined amount of time to the target drying time;

TM is a time adjustment factor based on a selected temperature of the selected laundry treatment operation; and

φ_1, φ_2, and φ_3 are factors adjusted according to the feedback input.

4. The method of claim **2**, wherein the adjusted set of operating parameters are stored within a memory of the laundry treatment appliance as a history of user feedback comprising a plurality of adjusted operating parameters.

5. The method of claim **4**, wherein subsequent iterations of the control algorithm incorporate the history of user feedback comprising the plurality of adjusted operating parameters.

6. The method of claim **2**, wherein the original set of operating parameters comprises:

an adder term comprising a positive integer that increases a total laundry treatment operation time;

a target moisture score comprising a value that represents a dryness of a laundry load as determined by a humidity sensor provided within the laundry treatment appliance; and

a multiplier term comprising a positive integer that increases or decreases a total laundry treatment operation time as a function of a time to the target moisture score.

7. The method of claim **6**, wherein the adjusting the at least one operating parameter comprises making one of a fine adjustment or a coarse adjustment.

8. The method of claim **7**, wherein the dryness level is selected by the user according to a sliding scale of dryness of the laundry load, and wherein the fine adjustment or the coarse adjustment are determined based on the dryness level selected.

9. The method of claim **8**, wherein the sliding scale of dryness of the laundry load is presented to the user via a remote device remotely connected to the laundry treatment appliance.

10. The method of claim **2**, wherein the selected laundry treatment operation comprises a total cycle time, the total cycle time being a greater of a calculated target time and a minimum cycle time, the calculated target time being determined via the control algorithm.

11. The method of claim **1**, wherein the at least one operating parameter selected for adjustment is determined at least in part by a selected cycle of the laundry treatment appliance.

12. The method of claim **1**, further comprising:

performing a subsequent laundry treatment operation on a subsequent laundry load in accordance with the adjusted set of operating parameters;

obtaining a subsequent input feedback from the user regarding the dryness level of the subsequent laundry load;

adjusting at least another operating parameter of the adjusted set of operating parameters in response to obtaining the subsequent feedback input, the at least another operating parameter being different from the at least one operating parameter; and

storing a subsequent adjusted set of operating parameters comprising the at least another adjusted operating parameter.

13. The method of claim **1**, further comprising:

determining that an interruption to the laundry treatment appliance has been triggered; and

resetting the adjusted set of operating parameters to the original set of operating parameters in response to an input from the user, wherein the interruption is one of a loss of power to the laundry treatment appliance or a new airflow regime to the laundry treatment appliance.

14. A laundry treatment appliance, comprising:

a cabinet forming a receiving space;

a tub rotatably provided within the receiving space; and

a controller operably coupled to the tub, the controller being configured to perform a series of operations, the series of operations comprising:

performing a selected laundry treatment operation on a laundry load in accordance with an original set of operating parameters;

obtaining a feedback input from a user regarding a dryness level of the laundry load upon completion of the selected laundry treatment operation;

adjusting at least one operating parameter of the original set of operating parameters in response to obtaining the feedback input; and

generating an adjusted set of operating parameters comprising the at least one adjusted operating parameter.

15. The laundry treatment appliance of claim **14**, wherein the original set of operating parameters and the adjusted set of operating parameters are incorporated into a control algorithm, the control algorithm outputting a target time for completing the selected laundry treatment operation.

16. The laundry treatment appliance of claim **15**, wherein the control algorithm comprises a target time equation for determining the target time for completing the selected laundry treatment operation, the target time equation comprising:

$$\text{Target Time}=([t_{TV_0*\varphi_1}*(M_0*\varphi_2)]+A_0\varphi_3-t_{TV_0})*TM+t_{TV_0}$$

wherein t_{TV_0} is a time to reach a target moisture score;

TV_0 is the target moisture score;

M_0 is a multiplier term for altering the time to reach the target moisture score;

A_0 is an adder term for adding a predetermined amount of time to the target drying time;

TM is a time adjustment factor based on a selected temperature of the selected laundry treatment operation; and

φ_1, φ_2, and φ_3 are factors adjusted according to the feedback input.

17. The laundry treatment appliance of claim **15**, further comprising a humidity sensor provided within the tub, and wherein the original set of operating parameters comprises:

an adder term comprising a positive integer that increases a total laundry treatment operation time;

a target moisture score comprising a value that represents a dryness of a laundry load as determined by the humidity sensor; and

a multiplier term comprising a positive integer that increases or decreases a total laundry treatment operation time as a function of a time to the target moisture score.

18. The laundry treatment appliance of claim **15**, wherein the adjusted set of operating parameters are stored within a memory of the laundry treatment appliance as a history of user feedback comprising a plurality of adjusted operating parameters.

19. The laundry treatment appliance of claim **18**, wherein subsequent iterations of the control algorithm incorporate the history of user feedback comprising the plurality of adjusted operating parameters.

20. The laundry treatment appliance of claim **14**, wherein the series of operations further comprises:

determining that an interruption to the laundry treatment appliance has been triggered; and

resetting the adjusted set of operating parameters to the original set of operating parameters in response to an input from the user, wherein the interruption is one of a loss of power to the laundry treatment appliance or a new airflow regime to the laundry treatment appliance.

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