Document WO 2009/061857 A2 proposes a method for automatically generating work orders for a toilet, whereby not only states of a large number of device sensors, but also states of a non-device sensor are captured and these states are used to determine the state of a device, which has no sensor. In particular, the need for replenishing consumables is calculated.

In the document US 2011/0114202 A1, a valve in a water supply line is closed by means of a control when an unusual water flow rate is detected by a sensor located in the water supply line, and is opened again after a waiting period.

The immediate detection of a malfunction of a urinal and/or the correct assignment of a malfunction of a urinal to a specific cause is often problematic. For example, when the urinal is flushed, the water flowing from the fluid inlet via the urinal ceramic to the urinal outlet passes the urinal outlet after a certain delay. In some urinal systems, such a delay can be caused, for example, by a hydraulic delay in the inlet valve, the path to be covered by hoses/pipes between the inlet valve and the fluid inlet, or by reservoir devices. However, a malfunctioning inlet valve or an at least partially obstructed urinal outlet can also lead to delays. With known urinal systems, the specific cause of the problem can usually only be determined by a sanitary technician or service employee, despite the sensors used.

Summary

Embodiments of the present disclosure seek to increase the functionality of the urinal system mentioned at the outset, the water consumer system mentioned at the outset, and the methods mentioned above.

An aspect of the present disclosure provides a urinal system having a urinal bowl, a fluid inlet with an inlet valve, a urinal outlet, at least one HF motion sensor for detecting fluid motion provided on the urinal bowl and/or at the urinal outlet, and a urinal controller coupled with the at least one HF motion sensor and the inlet valve, wherein the urinal controller has a data processing system and/or is connected to a data processing system which is designed to i) obtain data captured by HF motion sensor, ii) evaluate the data arithmetically and iii) based on the evaluated data, identify at least one of the following malfunctions:

- that the urinal outlet is obstructed,
- that the fluid inlet is malfunctioning,
- that the inlet valve is malfunctioning, and
- that there is a malfunction of the at least one HF motion sensor,

wherein the data processing system comprises at least one data processing block that is machine-learning and/or comprises an artificial neuronal net and/or includes an expert system.

The urinal system according to the present disclosure can have a urinal bowl or a plurality of urinal bowls.

The at least one HF motion sensor is preferably arranged on the urinal bowl and/or the urinal outlet in such a way that it can detect flowing fluids in the region of a drain of the urinal bowl. The at least one HF motion sensor is preferably arranged on the rear side of the urinal bowl in the immediate spatial vicinity of the urinal outlet. In particular, the at least one HF motion sensor itself or at least one holding device comprising the at least one HF motion sensor is glued, bolted, or otherwise fastened to the rear of the urinal bowl.

The at least one HF motion sensor preferably does not point in the direction of a sealing water in an odor trap of the urinal outlet. The arrangement and alignment of the motion sensor advantageously ensures that it is able to detect the flush water flowing from the fluid inlet to the urinal outlet during a urinal flushing process and/or the urine hitting and/or flowing out of the urinal bowl when the urinal system is used.

The data acquired by the at least one HF motion sensor are retrieved and/or received by the data processing system contained in the urinal controller or connected to it. The data is preferably transmitted via a wireless or mesh data transmission network, such as via Bluetooth, for example, and particularly preferably via Bluetooth mesh. This advantageously enables communication with a mobile device, which has the advantage of a simplified operating function and simple setting and diagnosis options. It is also advantageous that communication with a building control via a cloud or a building management system is made possible, which in particular simplifies the retrieving of operating data or

transmission network, such as Bluetooth or Bluetooth mesh. Advantageously, this form of connection enables the water consumer system to communicate with a mobile device, which has the advantage of a simplified operating function and simple adjustment and diagnosis options. It is also advantageous if the water consumer system can communicate with a building control via a cloud or a building management system, which in particular simplifies the retrieving of operating data or the display of service requirements. Another advantage of data transmission using a wireless or mesh data transmission network, such as Bluetooth or Bluetooth mesh, is the ability to communicate with other sensor products either directly in the network or indirectly via at least one gateway.

Another aspect of the present disclosure provides a method for operating a urinal system having a urinal bowl, a fluid inlet with an inlet valve, a urinal outlet, at least one HF motion sensor for detecting fluid motion provided on the urinal bowl and/or at the urinal outlet, and a urinal controller which is coupled with the at least one HF motion sensor and the inlet valve, wherein the urinal controller has a data processing system and/or is connected to a data processing system i) obtains data captured by the at least one HF motion sensor, ii) evaluates the data arithmetically and, iii) based on the evaluated data, recognizes when there is one of the following malfunctions:

- that the urinal outlet is obstructed,
- that the fluid inlet is malfunctioning,
- that the inlet valve is malfunctioning,
- that there is a malfunction of the at least one HF motion sensor,

wherein the data processing system comprises at least one data processing block that is machine-learning and/or comprises an artificial neuronal net and/or includes an expert system.

The urinal system operated with the method according to the present disclosure can have a urinal bowl or a plurality of urinal bowls.

Claims

1.Urinal system comprising a urinal bowl, a fluid inlet with an inlet valve, a urinal outlet, at least one HF motion sensor for detecting fluid motion provided on the urinal bowl and/or at the urinal outlet and a urinal controller coupled with the at least one HF motion sensor and the inlet valve, wherein the urinal controller comprises a data processing system and/or is connected to a data processing system, which is arranged to i) obtain data captured by the HF motion sensor, ii) evaluate the data arithmetically and iii) based on the evaluated data, identify at least one of the following malfunctions:
that the urinal outlet is obstructed,
that the fluid inlet is malfunctioning,
that the inlet valve is malfunctioning, and
that there is a malfunction of the at least one HF motion sensor,
wherein the data processing system comprises at least one data processing block that is machine-learning and/or comprises an artificial neuronal net and/or includes an expert system.

2.The urinal system of any one of the preceding claims, wherein the urinal system comprises an error message and/or service notification output unit coupled with the data processing system.

3.The urinal system of any one of the preceding claims, wherein the data processing system is arranged to identify at least one of a predefined urinal usage situation and frequency of use based on the evaluated data, and adjust at least one of an opening time, an opening position and an opening frequency of the inlet valve based thereon during at least one subsequent urinal flushing process.

4.The urinal system of claim 1, wherein the urinal system further comprises at least one pressure sensor and/or at least one flow sensor in the fluid inlet and/or is coupled with at least one pressure sensor and/or at least one flow sensor in the fluid inlet via a meshed data transmission network, wherein the data processing system is further arranged to i) obtain data captured by at least one of the pressure sensor and the flow sensor, ii) evaluate the data arithmetically and iii) based on the evaluated data, identify at least one of the following malfunctions:
that the urinal outlet is obstructed,
that there is a pressure fluctuation in a wastewater system connected to the urinal system,
that pressure in the fluid inlet has dropped below a minimum pressure value, or has exceeded a maximum pressure value, and

that the fluid inlet or the inlet valve is malfunctioning.

5.The urinal system of claim 1, wherein the inlet valve is arranged to open for a pre-defined time if water and/or urine is detected by the HF motion sensor.

6.Water consumer system comprising a urinal system according to one of the preceding claims, wherein the water consumer system comprises at least one additional water consumer in addition to the urinal system, where at least one additional sensor is provided, wherein the data processing system is coupled with the at least one additional sensor and is arranged to arithmetically evaluate the data captured by the at least one additional sensor and received by the data processing system and to include the data into the detection and/or prevention of at least one of the malfunctions.

7.The water consumer system of claim 6, wherein the water consumers and the urinal system are connected with each other via a meshed and/or a wireless local data transmission network.

8.Method for operating a urinal system comprising a urinal bowl, a fluid inlet with an inlet valve, a urinal outlet, at least one HF motion sensor for detecting fluid motion provided on the urinal bowl and/or at the urinal outlet and a urinal controller coupled with the at least one HF motion sensor and the inlet valve, wherein the urinal controller comprises a data processing system and/or is connected to a data processing system, which i) obtains data captured by the at least one HF motion sensor, ii) evaluates the data arithmetically and,
iii) based on the evaluated data, recognizes when there is one of the following malfunctions:
that the urinal outlet is obstructed,
that the fluid inlet is malfunctioning,
that the inlet valve is malfunctioning.
that there is a malfunction of the at least one HF motion sensor,
wherein the data processing system comprises at least one data processing block that is machine-learning and/or comprises an artificial neuronal net and/or includes an expert system.

9.The method of claim 8, wherein a fluid pressure is captured by means of at least one pressure sensor and/or a fluid flow is captured by means of at least one flow sensor in the fluid inlet, the captured fluid pressure and/or the captured fluid flow is/are transmitted to the data processing system, the data processing system arithmetically evaluates the captured fluid pressure and/or the captured fluid flow along with the data obtained by the at least one HF motion sensor and, based on the evaluated data, recognizes when there is at least one of the following malfunctions and/or triggers at least one action in order to prevent at least one of the

following malfunctions:
that the urinal outlet is obstructed,
that there is a pressure fluctuation in a wastewater system connected to the urinal system,
that pressure in the fluid inlet has dropped below a minimum pressure value or exceeded a maximum pressure value,
that the fluid inlet or the inlet valve is malfunctioning.

10.The method of claim 8, wherein the inlet valve opens for a predefined time if water and/or urine is detected by the HF motion sensor.

11.The method of any one of claims 8 to 10, wherein the data processing system recognizes that the urinal outlet is blocked and/or the fluid inlet is faulty, if no water and/or urine is detected by the HF motion sensor even though the inlet valve is open and/or it is detected by means of the at least one HF motion sensor that at least a lower area within the urinal bowl is filled with standing fluid.

12.The method of claim 11, wherein the data processing system recognizes whether the urinal outlet is blocked or the fluid inlet is faulty, if no water and/or urine is detected by the at least HF motion sensor even though the inlet valve is opened and fluid pressure has been captured by the at least one pressure sensor and/or fluid flow has been captured by the at least one flow sensor and/or it is detected by means of the at least one HF motion sensor that at least a lower area within the urinal bowl is filled with standing fluid.

13.The method of claim 9, wherein the data processing system recognizes that the urinal outlet is partially blocked and/or the fluid inlet is faulty, if it is detected by the at least one HF motion sensor that there is a delayed drainage of fluid from the urinal bowl even though the inlet valve is opened.

14.The method of claim 13, wherein the data processing system recognizes, whether the urinal outlet is partially blocked or the fluid inlet is faulty when it is detected by the at least one HF motion sensor that fluid drains from the urinal bowl with a delay even though the inlet valve is opened and fluid pressure has been captured by the at least one pressure sensor and/or fluid flow has been captured by the at least one flow sensor.

15.The method of any one of claims 9 and 11 to 14, wherein a respective opening time of the inlet valve is adjusted to the respective fluid pressure and/or the respective fluid flow in the fluid inlet by the urinal controller.

16.The method of any one of the claims 8 to 15, wherein the data processing system recognizes that the fluid inlet is faulty, if the at least one HF motion sensor detects no fluid flow and/or a permanent fluid flow and/or a fluid flow beneath a fluid flow threshold value.

17.The method of any one of claims 8 to 16, wherein the urinal system comprises an error message and/or service notification output unit coupled with the data processing system and that the data processing system puts out a service notification to the error and/or service notification output unit when it recognizes at least one of the malfunctions.

18.The method of any one of claims 8 to 17, wherein the data processing system recognizes that there is a pressure fluctuation in the waste water system connected to the urinal bowl if a series of consecutive faulty urinal flushing processes on the urinal system results from the process of the data of the at least one HF motion sensor and/or a signal pattern of the data of the at least one HF motion sensor corresponds to a characteristic fluctuation of the fluid level in the urinal outlet.

19.The method of any one of claims 8 to 18, wherein when the data processing system recognizes that there is a pressure fluctuation in a waste water system connected to the urinal system, the urinal controller changes a sensitivity of the at least one HF motion sensor and/or when a signal pattern of the data of the at least one HF motion sensor corresponds to a characteristic fluctuation of the fluid level in the urinal outlet, does not initiate a urinal flushing process.

20.The method of any one of claims 8 to 19, wherein the data processing system comprises at least one data processing block, which is machine-learning and/or works based on an artificial neuronal net and/or is an expert system.

21.The method of any one of claims 8 to 20, wherein the urinal system is integrated into a water consumer system, which comprises at least one additional water consumer in addition to the urinal system, where at least one additional sensor is provided, wherein the data processing system is coupled with the at least one additional sensor and also arithmetically evaluates the data received by the at least one additional sensor, wherein at least one flushing time and/or blockage in an outlet and/or pressure fluctuation in a waste water system and/or defect of an inlet device of the at least one additional water consumer determined thereby, is included in the detection of at least one of the malfunctions.

22.The method of claim 21, wherein the water consumers and the urinal system communicate with each other via a meshed and/or a wireless local data transmission network.

23.The method of any one of claims 8 to 22, wherein there is a malfunction of at least one of the at least one HF motion sensor if the data processing system does not receive data from at least one of the at least one HF motion sensor or the data of at least one of the at least one HF motion sensor received by the data processing system are not processible by the data processing system and/or at least one of the at least one HF motion sensor issues at least one service signal.