Claims

1. A method of determining a concentration of an analyte in a bodily fluid by using a mobile device ~~(110)~~ having a camera ~~(112)~~, the method comprising:
   a) taking a series of calibration images ~~(114)~~ of at least one region of interest ~~(116)~~ of an object ~~(118)~~ by using the camera ~~(112)~~, wherein the calibration images ~~(114)~~ differ in their brightness;
   b) deriving from each calibration image ~~(114)~~ of the series taken in step a) at least one key calibration figure ~~(137)~~ characteristic for a tone mapping function of the mobile device ~~(110)~~;
   c) determining at least one probable tone mapping function ~~(120)~~ of the mobile device ~~(110)~~ by taking into account the key calibration figures ~~(137)~~ from the calibration images ~~(114)~~ of the series taken in step a);
   d) taking at least one analysis image of at least part of a test field ~~(122)~~ of an optical test strip ~~(124)~~, the test field ~~(122)~~ having the bodily fluid applied thereto; and
   e) determining the concentration of the analyte in the bodily fluid from the analysis image of the test field ~~(122)~~ by taking into account the probable tone mapping function ~~(120)~~ of the mobile device ~~(110)~~.

2. The method according to the preceding claim, wherein steps d)-e) are performed repeatedly, wherein steps a)-c) either only once initially for a plurality of repetitions of steps d)-e) or each time before performing steps d)-e) or at a predetermined frequency.

3. The method according to any one of the preceding claims, wherein the object ~~(118)~~ comprises the optical test strip ~~(124)~~, wherein the analysis image coincides with at least one of the calibration images ~~(114)~~, such that the analysis image is taken as part of the series of calibration images ~~(114)~~.

4. The method according to any one of the preceding claims, wherein the region of interest ~~(116)~~ comprises at least one element of the group consisting of: a white field; a black field ~~(139)~~; a grey field; a grey scale step wedge ~~(142)~~.

5. The method according to any one of the preceding claims, wherein each calibration image ~~(114)~~ comprises at least two regions of interest ~~(116)~~, wherein particularly a physical brightness ratio between the two regions of interest ~~(116)~~ is known.

6. The method according to any one of the preceding claims, wherein for each calibration image ~~(114)~~ the key calibration figure ~~(137)~~ is derived from at least one brightness value of the region of interest ~~(116)~~ of the calibration image ~~(114)~~.

7. The method according to any one of the preceding claims, wherein the brightness of the calibration images ~~(114)~~ is varied in step a) by varying a parameter value of at least one of the following parameters: an exposure time ~~(136)~~; a light sensitivity of an image sensor of the camera ~~(112)~~; a light intensity of an illuminant.

8. The method according to the preceding claim, wherein step c) comprises determining at least one sampling point ~~(140)~~ for each calibration image ~~(114)~~ wherein the sampling point ~~(140)~~ comprises the key calibration figure ~~(137)~~ and the parameter value.

9. The method according to the preceding claim, wherein step c) comprises determining the probable tone mapping function ~~(120)~~ by at least one of the following: determining a correlation, particularly a fit curve, for the sampling points ~~(140)~~ of the series of calibration images ~~(114)~~; choosing a correlation, in particular a function, from a predetermined set of correlations, wherein the chosen correlation fits the sampling points ~~(140)~~ of the series of calibration images ~~(114)~~.

10. The method according to any one of the preceding claims, wherein step e) comprises deriving at least one key analysis figure ~~(186)~~ from at least one brightness value ~~(138)~~ of at least one part of the analysis image showing the at least one part of the test field ~~(122)~~.

11. The method according to the preceding claim, wherein from each key analysis figure ~~(186)~~ at least one probable analyte measurement figure is derived by applying the inverted probable tone mapping function ~~(120)~~ to the key analysis figure ~~(186)~~.

12. The method according to any one of the preceding claims, wherein in step e) the analyte concentration is determined from a brightness ratio between the test field ~~(122)~~ having the bodily fluid applied and the region of interest ~~(116)~~ of the object ~~(118)~~.

13. A computer program comprising computer-executable instructions which, when the computer program is executed by a computer, specifically a processor of a mobile device ~~(110)~~, cause the computer to carry out method steps b), c) and e) of any one of the preceding claims.

14. A mobile device ~~(110)~~ having a camera ~~(112)~~ and a processor ~~(180)~~, the processor ~~(180)~~ being configured to perform the following steps:

i.) prompting a user to take a series of calibration images ~~(114)~~ of at least one region of interest ~~(116)~~ of an object ~~(118)~~ by using the camera ~~(112)~~, wherein the calibration images ~~(114)~~ differ in their brightness;

ii.) deriving from each calibration image ~~(114)~~ of the series taken in step i.) at least one key calibration figure ~~(137)~~ characteristic for a tone mapping function of the mobile device ~~(110)~~;

iii.) determining at least one probable tone mapping function ~~(120)~~ of the mobile device ~~(110)~~ by taking into account the key calibration figures ~~(137)~~ from the calibration images ~~(114)~~ of the series taken in step i.);

iv.) prompting the user to take at least one analysis image of at least part of a test field ~~(122)~~ of an optical test strip ~~(124)~~, the test field ~~(122)~~ having the bodily fluid applied thereto; and

v.) determining a concentration of an analyte in a bodily fluid from the analysis image of the test field ~~(122)~~ by taking into account the probable tone mapping function ~~(120)~~ of the mobile device ~~(110)~~.

15. A kit ~~(182)~~ for determining a concentration of an analyte in a bodily fluid, the kit ~~(182)~~ comprising:

- at least one mobile device ~~(110)~~ according to any one of the preceding claims referring to a mobile device ~~(110)~~; and
- at least one optical test strip ~~(124)~~ having at least one test field ~~(122)~~.