~~[CLAIMS]~~ CLAIMS

~~[Claim 1]~~

1. A position estimation apparatus, comprising:

a measurement unit for measuring the signal strength of wireless signals received by a communication unit from a plurality of transmitters;

a moved distance calculation unit for calculating an estimated moved distance of a wireless terminal;

a reference area determining unit ~~determines~~ for determining a reference area ~~that includes~~ including a position of a mobile communications station, wherein the reference area determining unit is operable to:

search an estimation result storage unit for a most recent position estimation result of a wireless terminal, and

calculate the moved distance of the wireless terminal based on the most recent position estimation result; and

a position estimation unit that ~~estimates~~ for estimating the position of said mobile communication station based on the position information of ~~a~~ the plurality of transmitters within said reference area, wherein the position estimation unit is operable to:

search a base station information unit for position information of transmitters that transmitted the wireless signals whose signal strengths have been measured by the measurement unit,

determine the transmitters that are outside the reference area, and

estimate the position information based on the position information of transmitters inside the reference area.

~~[Claim 2]~~

2. The apparatus of claim 1, wherein:

said reference area determining unit determines said reference area by combining an estimated move distance of said apparatus with a predetermined communication range of at least one of said plurality of transmitters.

~~[Claim 3]~~

~~The apparatus of claim 2, further comprising:~~

~~a movement detector that estimates the estimated move distance of said apparatus.~~

~~[Claim 4]~~

3. The apparatus of claim ~~3~~1, wherein

said movement detector ~~being~~ is an accelerometer.

~~[Claim 5]~~

4. The apparatus of claim 1, further comprising:

a GPS-based location device that detects location information based on wireless satellite transmissions, wherein

said reference area determining unit determines the reference area by combining a GPS uncertainty amount with a predetermined communication range of at least one of said plurality of transmitters.

~~[Claim 6]~~

5. The apparatus of claim 1, further comprising:

a computer readable storage device that stores a previous position estimation result for said apparatus in association with time, wherein

~~and~~ said reference area determining unit determines said reference area by using the previous position estimation result as a standard.

~~[Claim 7]~~

~~The apparatus of claim 6, wherein:~~

~~said reference area determining unit determines the reference area by calculating the estimated move distance.~~

~~[Claim 8]~~

6. The apparatus of claim ~~6~~ 1, wherein

said position estimation unit estimates the move distance by measuring a propagation distance from the plurality of transmitters.

~~[Claim 9]~~

7. The apparatus of claim 1, wherein

said position estimation unit excludes from consideration transmitters outside of the reference area based on signal information from respective of said plurality of transmitters.

~~[Claim 10]~~

8. The apparatus of claim 1, wherein

the position estimation unit estimates the position of the mobile communication station by calculation of

$$O = \frac{1}{W} \cdot \sum_i (Wi \cdot Ai)$$

(Mathematical Formula 1)

$$Wi = \frac{1}{distS(O, Ai)}$$

(Mathematical Formula 2)

$$W = \sum_i Wi$$

(Mathematical Formula 3)

, wherein

O being a position, A_i being position information of an ith transmitter, and W_i being a weighting coefficient.

~~[Claim 11]~~

9. The apparatus of claim ~~9~~7, ~~wherein~~ further comprising

a computer readable storage unit that stores transmitter reliability information regarding whether a particular transmitter has been detected as having a low reliability with at least a predetermined frequency of occurrence, and

said position estimation unit excludes transmitters having a stored reliability below a predetermined threshold when estimating the position of the mobile communication station.

~~[Claim 12]~~

10. The apparatus of claim ~~9~~7, wherein

said position estimation unit excludes transmitters having a received signal characteristic indicating the transmitter is outside of the reference area.

~~[Claim 13]~~

11. The apparatus of claim 1, further comprising:

a communications interface that receives transmitter signal information and reference area information from said mobile communication station, and sends an estimate of said position of said mobile communication station to said mobile communication station.

~~[Claim 14]~~

12. The apparatus of claim 1, further comprising:

the mobile communication station.

~~[Claim 15]~~

13. A position estimation method comprising:

measuring the signal strength of wireless signals received by a communication unit from a plurality of transmitters;

calculating an estimated moved distance of a wireless terminal by a moved distance calculation unit;

determining with a processing device a reference area including a position of a mobile communications station, wherein the step of determining the reference area comprises:

searching an estimation result storage unit for a most recent position estimation result of a wireless terminal, and

calculating the moved distance of the wireless terminal based on the most recent position estimation result; and

estimating the position of the mobile communication station based on the position information of ~~a~~ the plurality of transmitters within said reference area, wherein the step of estimating the position of the mobile communication station comprises:

searching a base station information unit for position information of transmitters that transmitted the wireless signals whose signal strengths have been measured by the measurement step,

determining the transmitters that are outside the reference area, and

estimating the position information based on the position information of transmitters inside the reference area.

~~[Claim 16]~~

14. A computer readable storage device having computer readable instructions that when executed by a processing device perform a position estimation method comprising:

measuring the signal strength of wireless signals received by a communication unit from a plurality of transmitters;

calculating an estimated moved distance of a wireless terminal by a moved distance calculation unit;

determining with the processing device a reference area including a position of a mobile communications station, wherein the step of determining the reference area comprises:

searching an estimation result storage unit for a most recent position estimation result of a wireless terminal, and

calculating the moved distance of the wireless terminal based on the most recent position estimation result; and

estimating the position of the mobile communication station based on the position information of ~~a~~ the plurality of transmitters within said reference area, wherein the step of estimating the position of the mobile communication station comprises:

searching a base station information unit for position information of transmitters that transmitted the wireless signals whose signal strengths have been measured by the measurement step,

determining the transmitters that are outside the reference area, and

estimating the position information based on the position information of transmitters inside the reference area.

~~[Claim 17]~~

15. A mobile communications station comprising:

a receiver that receives transmissions from a plurality of transmitters;

a measurement unit for measuring the signal strength of wireless signals received by a communication unit from a plurality of transmitters;

a moved distance calculation unit for calculating an estimated moved distance of a wireless terminal;

a reference area determining unit that determines a reference area ~~that includes therein~~ including a position of the mobile communications station, wherein the reference area determining unit is operable to:

search an estimation result storage unit for a most recent position estimation result of a wireless terminal, and

calculate the moved distance of the wireless terminal based on the most recent position estimation result; and

a communication interface that sends

signal information from said transmissions of said plurality of transmitters, and

said reference area to a remote device, and receives from said remote device an estimated position of said mobile communication station after said remote device used said signal information and reference area to estimate said position of said mobile communication station ~~by using transmissions from a subset of said plurality of transmitters located within said reference area and excluding transmissions from a subset of said plurality of transmitters located outside of said reference area~~, wherein a position estimation unit for estimating said position of said mobile communication station is operable to:

search a base station information unit for position information of transmitters that transmitted the wireless signals whose signal strengths have been measured by the measurement unit,

determine the transmitters that are outside the reference area, and

estimate the position information based on the position information of transmitters inside the reference area.

~~[Claim 18]~~

16. A position estimation method comprising:

receiving transmissions from a plurality of transmitters;

measuring the signal strength of wireless signals received by a communication unit from a plurality of transmitters;

calculating an estimated moved distance of a wireless terminal by a moved distance calculation unit

determining with a processing device a reference area ~~that includes therein~~ including a position of the mobile communications station, wherein the step of determining the reference area comprises:

searching an estimation result storage unit for a most recent position estimation result of a wireless terminal, and

calculating the moved distance of the wireless terminal based on the most recent position estimation result;

sending signal information from said transmissions of said plurality of transmitters to a remote device;

sending said reference area to the remote device; and

receiving from said remote device an estimated position of said mobile communication station after said remote device used said signal information and reference area to estimate said position of said mobile communication station ~~by using transmissions from a subset of said plurality of transmitters located within said reference area and excluding transmissions from a subset of said plurality of transmitters located outside of said reference area~~, wherein the step of estimating the position of the mobile communication station comprises:

searching a base station information unit for position information of transmitters that transmitted the wireless signals whose signal strengths have been measured by the measurement step,

determining the transmitters that are outside the reference area, and

estimating the position information based on the position information of transmitters inside the reference area.

~~[Claim 19]~~

17. A computer readable storage device having computer readable instructions that when executed by a processing device perform a position estimation method comprising:

receiving transmissions from a plurality of transmitters;

measuring the signal strength of wireless signals received by a communication unit from a plurality of transmitters

determining with a processing device a reference area ~~that includes therein~~ including a position of the mobile communications station, wherein the step of determining the reference area comprises:

searching an estimation result storage unit for the most recent position estimation result of a wireless terminal, and

calculating the moved distance of the wireless terminal based on the most recent position estimation result;

sending signal information from said transmissions of said plurality of transmitters to a remote device;

sending said reference area to the remote device; and

receiving from said remote device an estimated position of said mobile communication station after said remote device used said signal information and reference area to estimate said position of said mobile communication station ~~by using transmissions from a subset of said plurality of transmitters located within said reference area and excluding transmission from a subset of said plurality of transmitters located outside of said reference area~~, wherein the step of estimating the position of the mobile communication station comprises:

searching a base station information unit for position information of transmitters that transmitted the wireless signals whose signal strengths have been measured by a measurement unit, and

determining the transmitters that are outside the reference area, and

estimating the position information based on the position information of transmitters inside the reference area.