

Claims

1. A data-input device
for using to enter data-inputs into an electronic or computing client device (CD),
5 the data-input device configured to be worn by a user on only one single hand,

wherein the data-inputs result from reading and interpreting user-input gestures;

wherein the user-input gestures consist of positions and movements between
10 digits (D1, D2, D3, D4, D5), other portions of the hand and components of the
data-input device worn on the hand, wherein the positions and movements are
relative to each other;

wherein reading and interpreting the user-input gestures is achieved via an
15 electromagnetic sensing;

wherein the electromagnetic sensing of the device is performed by sensing units
configured to be placed at/by specific spots/regions of the hand, the sensing
units configured to be placed at/by fingertips called fingertip sensing units (FU1,
20 FU2, FU3, etc.) and the sensing units configured to be placed not at/by fingertips
called not fingertip sensing units;

wherein the data-input device comprises:
 - at least one energy unit to provide energy used by the data-input device;
 - 25 - at least one fingertip sensing unit (FU1) worn on a thumb (D1) of the hand;
 - at least one not-fingertip sensing unit worn on an interdigit (I1, I2, I3, I4) or
on a digit that is not the thumb (D2, D3, D4, D5);
 - at least one processing unit to process information from electromagnetic
coupling sensed by the sensing units and to generate the data-inputs to be
30 sent to the client device (CD);
 - at least one energy connection unit (EC) to transmit wirelessly or via cable
power from energy unit(s) to other components of the data-input device;
 - at least one signals/data connection unit (SC, SC2, SC3, SC4) to connect
wirelessly or via cable the sensing units with the processing unit(s);
 - 35 - at least one data-inputs connection unit (IC) to connect wirelessly or via cable
processing unit(s) with the client device (CD);

and wherein the at least one fingertip sensing unit (FU1) further comprises:

- at least one outwards-oriented conductive terminal configured not to be in direct contact with human body tissue;
- insulating and/or electromagnetic shielding means (IN);
- 5 - fixation means to fix and support the at least one fingertip sensing unit and to assure removable attachment of whole or part of the at least one fingertip sensing unit;

and wherein when the data-input device comprises two or more fingertip sensing units (FU1, FU2, FU3, etc.), electromagnetic signals used by two or more fingertip sensing units are generated at different frequencies and/or with different wavelengths, wave amplitudes or other characteristics of the electromagnetic signals in order to enable unique identification of each individual fingertip sensing unit of the two or more fingertip sensing units when participating
15 in the user-input gestures and in order to facilitate simultaneous multi-channelled electromagnetic coupling between the two or more fingertip sensing units and other sensing units;

the data-input device characterized in that the at least one not-fingertip sensing unit is a body-contact sensing unit (BU, BU1, BU2), wherein the body-contact sensing unit comprises conductive terminal(s) in touch with human body tissue of the hand and is configured to sense electromagnetic coupling wherein human body tissue acts as dielectric.

25 2. The data-input device according to claim 1,
wherein the data-input device further comprises one or more further not-fingertip sensing unit(s), wherein the one or more further not-fingertip sensing unit(s) is(are) worn on interdigits (I1, I2, I3, I4) of the hand or on digits that are not the thumb (D2, D3, D4, D5);

30 wherein the one or more further not-fingertip sensing unit(s) is(are):

- body-contact sensing unit(s) (BU, BU1, BU2, etc.) as the at least one body-contact sensing unit described in claim 1; and/or
- conductor-contact sensing unit(s) (CU, CU1, CU2, etc.) with outwards-oriented conductive terminal(s) not in touch with human body tissue and
35 configured to sense electromagnetic coupling wherein nil or variable amount of air acts as dielectric;

wherein when one or several of the not-fingertip sensing units are worn on a same digit, said not-fingertip sensing unit(s) is(are) integrated into a set of elements with a common support, wherein said set of elements is called digit set
5 (DS, DS2, DS3, DS4, DS5); and/or

wherein when one or several of the not-fingertip sensing units are worn on a same interdigit, said not-fingertip sensing unit(s) is(are) integrated into a set of elements with a common support, wherein said set of elements is called interdigit
10 set (IS2, IS4).

3. The data-input device according to claim 2,
wherein conductive terminal(s) of the conductor-contact sensing units is(are) configured to be placed by a volar and/or radial side of proximal segments of
15 the digits.

4. The data-input device according to any of claims 1 and 2,
wherein each body-contact sensing unit (BU, BU1, BU2, etc.) comprises:
- at least one conductive terminal configured to be in touch with human body
20 tissue,
- insulating and/or electromagnetic shielding means,
- fixation means to fix and support the body-contact sensing unit and to assure removable-attachment of whole or part of the body contact sensing unit;

25 and wherein each conductor-contact sensing unit (CU, CU1, CU2, etc.) comprises:
- at least one conductive terminal configured not to be in touch with human body tissue,
- insulating and/or electromagnetic shielding means,
30 - fixation means to fix and support the conductor-contact sensing unit and to assure removable-attachment of whole or part of the conductor-contact sensing unit.

5. The data-input device according to claim 1,
35 wherein when one or several fingertip sensing units (FU1, FU2, FU3, etc.) are worn on a same digit, said fingertip sensing unit(s) is(are) integrated into a set

of elements with a common support, wherein said set of elements is called fingertip set (FS1); and/or

wherein supports of fingertip sets (FSS) present any of the following configurations:

- a hood-like element configured to be worn on a digit of the hand fully/partially covering or wrapping the fingertip of the digit and/or other parts of the skin surface of the digit;
- a ring-like element (RE) wherein the ring-like element is fully/partially circled and is configured to be worn on a digit of the hand partially covering or occluding the skin surface of the digit, including an attached hood-like element wherein the attached hood-like element is attached to the ring-like element and is configured to be worn on or over the digit fully/partially covering or wrapping the fingertip of the digit;
- an attachment mechanism or the like to allow easy engagement/disengagement with/from a small auxiliary component (AUX) wherein the small auxiliary component is fixedly attached to a fingernail of the hand of the user;
- an artificial nail complementing, extending or replacing a fingernail of the user and integrating the at least one fingertip sensing unit (FU1);
- a partial implant of the at least one fingertip sensing unit (FU1), wherein the at least one fingertip sensing unit is located inside human body tissue of a fingertip of the user leaving outwards-oriented conductive terminal(s) of the at least one fingertip sensing unit facing to the outside and sticking out of the skin of the fingertip; and any of the following combinations:
 - the circled ring-like element (RE) combined with the hood-like element;
 - the circled ring-like element (RE) combined with the attachment mechanism or the like;
 - the circled ring-like element (RE) combined with the artificial nail;
 - the circled ring-like element (RE) combined with the partial implant.

6. The data-input device according to claim 2, wherein supports of digit sets (DS, DS2, DS3, DS4) present a shape of a fully/partially-circled ring-like element configured to be worn on proximal segments of the digits.

7. The data-input device according to claim 6,

wherein the supports of digit sets (DS, DS2, DS3, DS4) present adjustment components/adaptations (LRA, TRA) to allow rotational and/or translational adjusting of supported not-fingertip sensing units into specific wearing/operating positions of the supported not-fingertip sensing units.

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8. The data-input device according to claim 2,
 wherein supports of interdigit sets (IS2, IS4) present a shape that comprises a combination of a hook-like shape and two partially circled ring-like shapes, wherein the hook-like shape is configured to be worn on an interdigit (I1, I2, I3,
 10 I4), and the two partially circled ring-like shapes are configured to be worn on proximal segments of digits adjacent to the interdigit.

9. The data-input device according to claim 8,
 wherein supports of interdigit sets (IS2, IS4) comprise a movable joint (MJ2,
 15 MJ4) to allow articulated connection between two parts of the support, wherein the movable joint is configured to induce separation and/or to avoid approximation relative to each other of the connected two parts of the support whilst keeping the two parts of the support connected via the movable joint.

20 10. The data-input device according to any of claims 2, 6 and 8,
 wherein at least one digit set or one interdigit set comprises a not-fingertip-set contact detector (NND) that detects touching contacts (N-N), wherein the touching contacts detected take place with intervention of the at least one digit set or interdigit set and without intervention of fingertip sensing units.

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11. The data-input device according to any of claims 2, 6, and 8,
 wherein adjacent digit or interdigit sets are joined to each other by flexible bridging elements (B2, B3, B4).

30 12. The data-input device according to any of claims 1 and 2,
 further comprising a bracelet-type component that is worn on the wrist of the hand and is configured to facilitate temporary hosting of all or part of the components of the data-input device.

35 13. The data-input device according to any of claims 1, 2, 4 and 5,
 wherein body-contact sensing units are at least two in number and worn on different digits and the processing unit(s) is(are) configured to enable using

delimited surfaces of skin of the hand as touchpads on which dynamic gestures, consisting of positioning and/or sliding a fingertip set (FS1) acting as a pointer, are converted into dynamic variations of the data-inputs for the client-device (CD).

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14. The data-input device according to claims 1, 2, 3, 4, 5, 12 and 13, wherein the data-input device further comprises:

- one or more further fingertip-sensing unit(s) worn on digits that are not the thumb (D2, D3, D4, D5), and/or
- 10 - one or more further not-fingertip sensing unit(s) worn on the thumb (D1).

15. The data-input device according to any of claims 1, 2, 4, 13 and 14, wherein when one or several body-contact sensing units (BU1, BU2, BU3, etc.) are worn on a same digit of the hand, said body-contact sensing unit(s) is(are)
- 15 supported and attached to the digit by a non-removable not-fingertip-set support configured as a full implant of said body-contact sensing unit(s) inside human body tissue of the digit leaving said body-contact sensing unit(s) completely under the skin and in contact with the human body tissue.