The invention concerns a method for shortening the access time to a particular target point of a data track of a disc rotating in a recording and/or reproduction device in which there is calculated the number A of data tracks lying between the last-scanned data track and the target track.

In a CD-player, an optical scanning device scans the data on a rotating disc-type recording medium, the so-called compact disc, by means of a light beam. The light beam scanning the data is guided along the spiral data tracks of the disc by means of a tracking control circuit.

In order that the CD-listener can hear his/her desired piece of music, the optical scanning device is guided as quickly as possible from the present position to the data track at which the desired piece of music begins. During this process, designated as track skipping, the light beam crosses a multiplicity of data tracks; it jumps from the track which has just been scanned to the target track. The quicker the track skipping is accomplished, the shorter the access time, the time which the user must wait until he/she can hear the desired piece of music.

From US-A-4,855,978 there is known an optical video disc player. Upon switching on the device, the optical scanning device is driven into the centre of the video disc. To shorten the access time, there is calculated the number of data tracks lying between the position of the scanning device in the disc centre and the target track.

In US-A-4,611,315 there is disclosed an optical reproduction device. In order to be able to skip with an optical scanner in a shorter access time, there is determined the difference between the address of the data track currently scanned by the scanning device and the address of the target track.

However, as skipping can only be directed at a track and not at the target point of the target track, the user must, in the most unfavourable cases, wait for one revolution of the disc to take place before the data can start to be read. This waiting time can be particularly disadvantageous in a system which scans the data with a constant path speed - frequently abbreviated to CLV system in accordance with the English expression Constant Linear Velocity. The waiting time varies between 120 ms and 330 ms according to whether the light beam has skipped to the innermost or outermost data track of the disc; this time is to be added to the skip time - i.e. the time needed by the light beam to jump from the current position to the target track. The access time to a certain target point on a data track is, therefore, increased by 120 ms to 330 ms.

It is, therefore, the object of the invention to provide a method which achieves a shortening of the access time.

The invention achieves this object in that the angular position of the last point scanned on the last data track scanned and the angular position of the target point on the target track are calculated, that the skip time T taken to reach the target point on the target track is calculated, that from the number A of data tracks, the angular positions of the two points and the skip time, there is calculated that rotational speed of the disc which is required so that, upon reaching the target track, the target point or a point within a predeterminable distance ahead of the target point is detected.

The invention is based on the recognition that the rotational speed of the disc can be so selected that, upon reaching the target track, the target point or a point within a predeterminable distance ahead of the target point is detected. The invention is further based on the recognition that this rotational speed can be calculated from the number A of data tracks lying between the last data track scanned and the target track, from the angular position of the last point scanned

and the angular position of the target point on the disc, as well as from the duration T of the skip. The duration of the skip can be calculated from the number A of tracks which are to be jumped over.

The invention will be explained by means of a simple numerical example and with the help of the figure, firstly for the case of a so-called CAV system, the abbreviation for Constant Angular Velocity, and thereafter for a so-called CLV system, the abbreviation for Constant Linear Velocity.

In the figure a disc CD is shown upon which the spiral data tracks run from the interior to the exterior. The disc rotates in the direction shown by the arrow. Lying between the last data track scanned S1 and the target track S2 there may be, for example, 500 tracks. The last point scanned P1 on the last data track scanned S1 lies on a radius which, looked at in the direction of rotation of the disc, forms an angle of +90° with the diameter B drawn in vertically as a reference axis. The target point P2 on the target track S2 lies on a radius which forms an angle of +180° with the reference axis B. Let the duration of the skip from point P1 to the target point P2 be e.g. T.

In order that the target point P2 is detected upon reaching the target track S2, the disc must rotate during the skip time T by a ½ revolution or by n + ½ revolutions. There is an infinite number of solutions because n is a whole number.

The invention will now be explained using the example of a CAV system.

Let the disc rotate at e.g. 300 r.p.m. Let the skip time T be for example, half a second. In a half second the disc rotates 300/60x2 = 2½ times. If the rotational speed of 300 r.p.m. is maintained, the light beam scanning the disc will meet the target track S2 precisely at the target point P2.

In a second numerical example let it be assumed that the skip time T = 1 second. In one second the disc rotates 300/60 = 5 times. In order that the target point P2 is immediately detected upon reaching the target track S2, the rotational speed of the disc must now be so altered that the disc turns, for example 5½ or 4½ times in the one second.

As already mentioned, mathematically speaking, an infinite number of solutions is possible. It is, therefore, advisable to select those solutions which lie nearest to the original rotational speed of 300 r.p.m. That is either 4½ x 60 = 270 r.p.m. or 5½ x 60 = 330 r.p.m. Therefore, if the rotational speed of the disc at the start of the skip is raised to 330 r.p.m. or lowered to 270 r.p.m., the light beam will, upon reaching the target track S2, meet the target point P2 precisely.

If the skip is performed from the outside to the inside, it is advisable with a CLV system to select the higher of the two rotational speeds calculated, because the rotational speed of the disc decreases upon scanning the data tracks from the inside to the outside with a CLV system. For the same reason, when skipping from the inside towards the outside it is advisable to select the lower of the two rotational speeds.

With a CLV system it is particularly advantageous to firstly calculate the rotational speed associated with the target track. From all possible solutions for the rotational speed which render it possible to immediately detect the target point P2 upon reaching the target track S2, that solution is chosen which comes nearest to the rotational speed associated with the target track.

This measure has the advantages that, upon reaching the target track, not only the target point is detected but that the disc already rotates approximately at the rotational speed prescribed for the target track.

The invention is suitable for recording and/or reproduction devices having contact-less scanning of a rotating disc such as compact disc players, video disc players, DRAW disc players or magneto-optical devices.

CLAIMS

1. A method for shortening the access time to a particular target point of a data track of a disc (CD) rotating in a recording and/or reproduction device, in which there is calculated the number A of data tracks lying between the last data track scanned (S1) and the target track (S2), **characterised in that** the angular position of the last point scanned (P1) on the last data track scanned (S1) and the angular position of the target point (P2) on the target track (S2) are calculated, that the skip time T taken to reach the target point (P2) on the target track (S2) is calculated, that from the number A of data tracks, the angular positions of the two points (P1, P2) and the skip time T, there is calculated that rotational speed of the disc (CD) which is required so that, upon reaching the target track (S2), the target point (P2) or a point within a predeterminable distance ahead of the target point (P2) is detected.

2. A method according to claim 1, **characterised in that** from the infinite number of mathematically possible solutions for the rotational speed, that solution is selected which comes nearest to the original rotational speed of the disc.

3. A method according to claim 1, **characterised in that** with a CLV system, upon skipping from the inside to the outside, there is chosen from the infinite number of mathematically possible solutions for the rotational speed which are lower than the original rotational speed, that solution which lies closest to the original rotational speed of the disc, while upon skipping from the outside to the inside, there is chosen from the infinite number of mathematical solutions for the rotational speed which are higher than the original rotational speed, that solution which lies closest to the original rotational speed of the disc.

* C L M S *

4. A method according to claim 1, **characterised in that** with a CLV system, from the infinite number of solutions that is selected which lies closest to the rotational speed prescribed for the target track.