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MOTION ON CONCENTRIC CIRCLE AND ITS IMPACT IN DEVELOPMENT OF SKILL

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ABSTRACT

The Concentric Circles are those circle which have common center with different radii. Therefore, all the circles of concentric circle may be either in rotational state or some circles in the dynamic state and some circle in static state. The author tried to explore the importance of the motion on concentric circle so that a learner can be able to develop skill in the daily life situation.

Keywords: *Concentric Circles, rotation, dynamic, static.*

INTRODUCTION

The Concentric Circles are combination of Circles having common center. A Circle may be either in static or dynamic state .Therefore, combination of circle having common center may be in either static or dynamics state if their center are related to circumference by the same extended straight line working as radius for the corresponding circle. Each circle of a concentric circle may be functionally related to each other. Also two or more different concentric circle having different center for each concentric circle may be functionally related to each other. Motion on concentric circle means movement in circumference of circle with fixed center. Motion can also be defined as a continuous change in the position of an object. Each type of motion is controlled by different type of force.

According to Newton’s first law of motion: “Everybody continues in its state of rest, or uniform motion in a straight line, except in so for as it be compelled by impressed force to change the state.”

Motion on Concentric circle of a triangle can be co-related with its uses in daily life situation. A tangent can be drawn at a point on the arc of a circle. A learner can create an innovative idea by understanding the uses of tangent drawn on the arc of the circle. The knowledge about tangent to a circle will enhance the idea to develop a skill to create a motion on the concentric circle.

2. MATHEMATICAL DEFINITION OF CIRCLE, CONCENTRIC CIRCLE AND EQUATION TANGENT AT A POINT ON THE CIRCLE

Definition: A **circle** is a simple shape in Euclidean **geometry**. It is the set of all points in a plane that are at a given distance from a given point, the centre; equivalently it is the curve traced out by a point that moves so that its distance from a given point is constant.

Definition: Concentric circles are circles that have the same center but radii of different lengths. The region bound by concentric circles of different radii is called the annulus.

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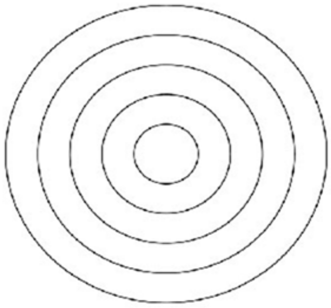


Figure 1: Concentric Circle

Definition: A tangent is a straight line or plane that touches a curve or curved surface at a point, but if extended does not cross it at that point

Equation of the tangent: The tanagent at a point P(x_1, y_1) to a curve y=f(x) is given by the formula:

$$y-y_1= (dy/dx)_{(x_1,y_1)} (x-x_1)$$

Examlpe 1: A tangent drawn on the circle at a point T is given in the following figure:

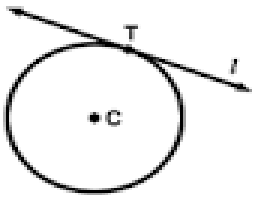


Figure 2: Tangent to a circle

Example 2: A tangent drawn on the circle of a concentric circle at a point D is given in the following figure:

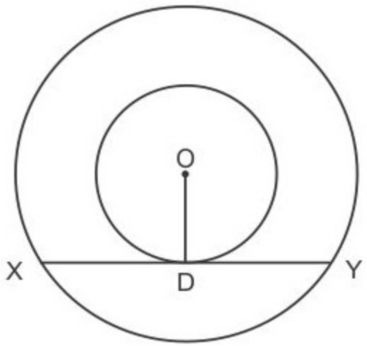
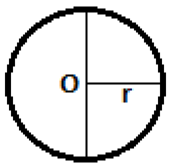
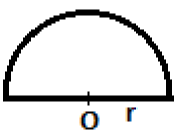
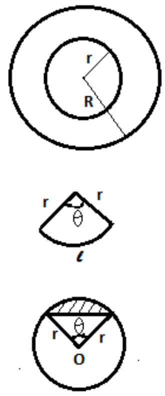


Figure 3: Tangent to a circle of a concentric circle

Mathematical relation on Circle

SERIAL NO	NAME	FIGURE	PERIMETER	Area
1	Circle		$2\pi r$ or πd	πr^2
2	Semi- circle		πr + 2r	½ πr^2
3	Ring (Shaded region)		2 $\pi(r$ + R)	π(R^2-r^2)
4	Sector of a circle		l+2r=$\frac{\pi r\theta}{180°}+2r$	$\frac{\pi r^2\theta}{360°}$ or $\frac{1}{2}lr$

5	Segment of a circle		$\frac{\pi r\theta}{180^\circ}$+2r Sin$\frac{\theta}{2}$	$\frac{\pi r^2\theta}{360^\circ}$ - $\frac{1}{2}r^2$sinθ

a. Length of an arc AB of a circle= $\frac{\theta}{360}2\pi r$

b. Area of major segment= Area of a circle – Area of minor segment

c. Distance moved by a wheel in 1 rotation=circumference of the wheel

d. Number of rotation in 1 minute =Distance moved in 1 minute / circumference

2.1 Relationship between circle and concentric circle: Every concentric circle is a combination of two or more than two circle. When each part (i.e., closed curve) of concentric circle is separated, it looks that each part is a circle. Hence, each circles of the concentric circle obeys the similar properties of a circle and also combination of circle with same center and different radii may generate the concentric circle.

2.2 Common tangent on two circle: There may be of different method for drawing common tangent to two circle. Common tangent can be drawn by external or internal method.

The following diagram represents the external and internal method of drawing common tangent to a circle.

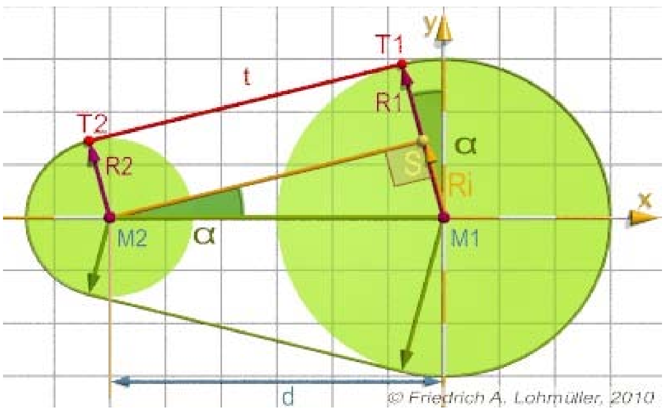


Figure-4

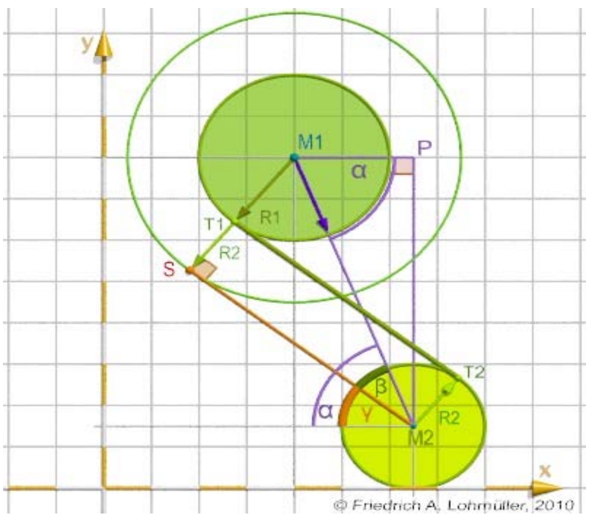


Figure-5

Therefore, two circle can be functionally related to each other. A function f may be defined from circleC_1 to circle C_2 or C_2 to circle C_1 i.e., f: $C_1 \rightarrow C_2$ or f: $C_2 \rightarrow C_1$ and function may be one-one or onto.

3. CORELATION OF CONCENTRIC CIRCLE WITH DAILY LIFE SITUATION

The motion on the concentric circle may be correlated with daily life situation. Two circle may be functionally related to each other.

Example 1: Magnetic Tape (cassette) is an example related to motion on concentric circle. Here, both concentric circle are functionally related to each other. Magnetic tape drive is needed for reading and writing data in magnetic tape. All magnetic tape drivers have two types reels. The one reel containing the tape to be read and write is called file reel and other is called take up reel.

Concentric circle C_1 **Figure-6** Concentric circle C_2

Hence**,** a function f: $C_1 \rightarrow C_2$ or f: $C_2 \rightarrow C_1$ can be defined for motion on concentric circle.

Example 2 (a): The motion on concentric circle can be applicable to understand the Disk Components which are explained in the following diagram:

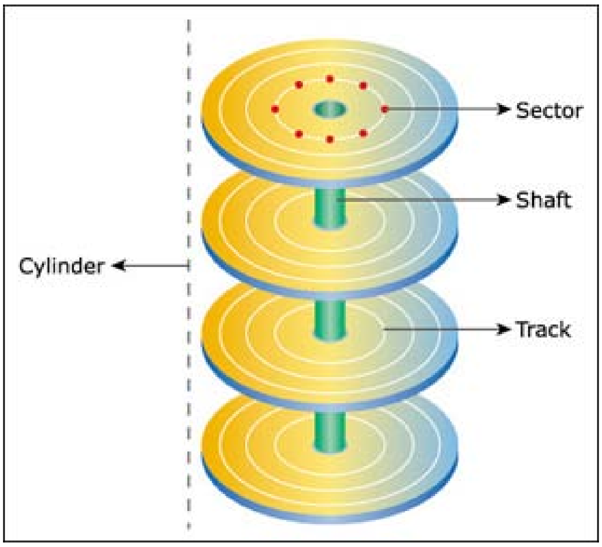


Figure-7

Example 2(b): The motion on the concentric can be useful on Hard disk. A hard disk is a magnetic disk which stores and provides relatively quick access of large amount of data .Data is recorded on concentric rings on the surface of the platters called tracks. Each platter has the same number of tracks.

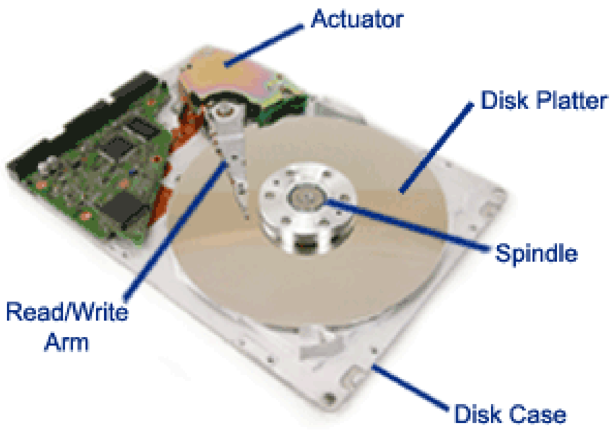


Figure-8

Following parts of a hard disk are explained below:

Disk Case: The rectangular shaped disk case holds all of the components of a hard disk drive. The case is secured by screws and should not be opened outside of a dust-free environment.

Disk Platter: The platter shaped like a record with a magnetic surface. Its job is to store the data contained on the hard disk drive. There can be one or multiple platters depending on the disk capacity. A spindle holds the platters together and the motor rotates them at a certain speed.

Spindle: The spindle holds the platters together and the motor rotates the platters at their designated speed, which is measured in RPM.

Actuator: This is designed to move the read/write arm to the correct position on the platter to read the data.

Read/Write Arm: The read/write arm contains many "heads" on the end of the arm which are designed to float above the platter and read data from the platter.

Example 2(c): Organization of a Disks are as follows:

(i) Disk contains concentric Circle
(ii) Tracks are divided into sectors
(iii) A sector is the smallest addressable unit in disk.

Here's a reference image of a hard disk of the same:

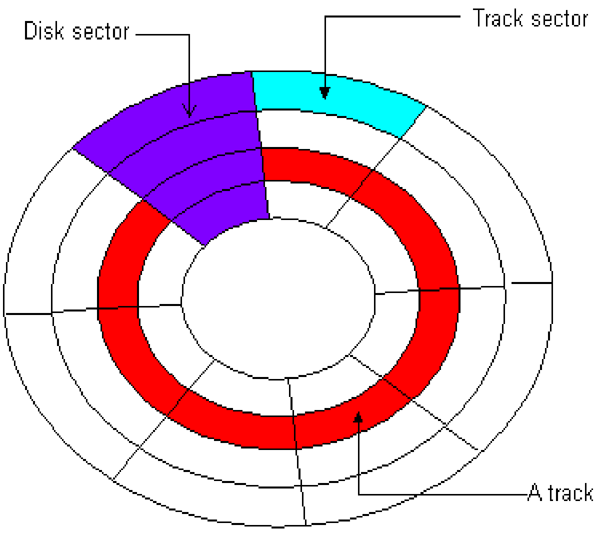


Figure-9

The red circle is a track, it may have many tracks. A sector is shown in purple. It should also note that the disk will be rotating and there's a head which reads from the rotating disk. The motion on concentric circle may impact in the following example:

Let us label the tracks from 0 (innermost, inside red circle) to 3 (outermost circular strip). Similarly the purple sector as 0 and going clockwise we name the others till 7. For our convenience we can refer (x, y) as the track sector (aqua blue) whose track is x and sector is y.

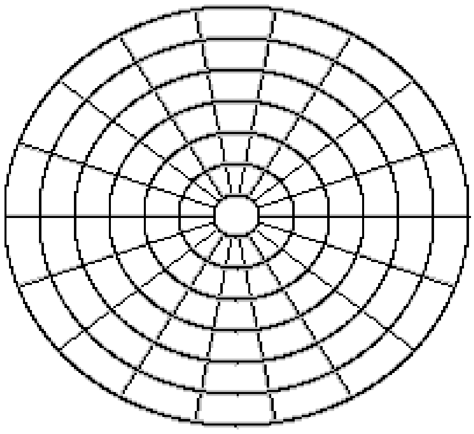
Seek time: Say we're reading some data from the (0, 4). We receive instructions to read from track (2, 5). The time it takes for us to move from track 0 to track 2 is seek time.

Latency: Once we reach track 2, we realize the head is above the 1st sector we'll have to wait till the disk rotates to the 5th sector so that we can start reading from (2, 5). The time we wait for the sector to be accessible by your head here is known as latency.

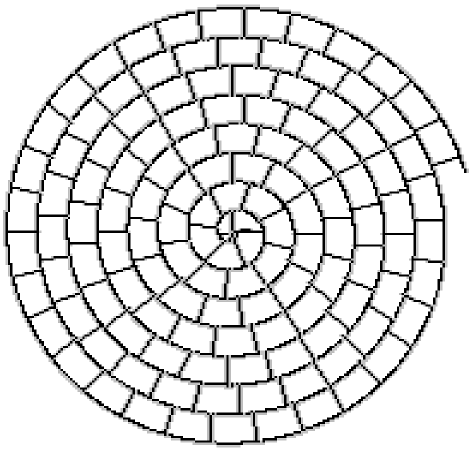
Example 2(d): Optical Disks like CD-ROM (Compact Disk Read Only Memory), CD-R/W (Compact Disk Read/Write) and DVD (Digital Versatile Disk) are also useful to understand the concept of motion of concentric circle in the daily life situation.

Note:

(i) In Magnetic Media (like floppy/hard disk) the surface is arranged into concentric circles called "tracks"
(ii) Number of sectors per track is constant for all tracks
(iii) The CD has one single track, starts at the center of the disk and spirals out to the circumference of the disk
(iv) This track is divided into sectors of equal size



Magnetic Disk



Optical Disk (Compact Disk)

4. CONCLUSION AND FUTURE SCOPE

The mathematical problem related to concentric circle will be helpful to prepare different types of models in optimal time and with optimal cost. There is an scope to develop a skill related to storage and retrieval of data from different types of disks. Also there is a scope to understand the conception and use of tangent on concentric circle.

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