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Relativity of Surroundings

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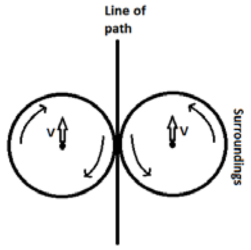
I. A body travelling on a linear path observes its surroundings in the form of discs.

II. As the body progresses on the linear path, the two discs on either side on the path of motion, moves along, one travelling clockwise and the other anti-clockwise, with the same velocity.



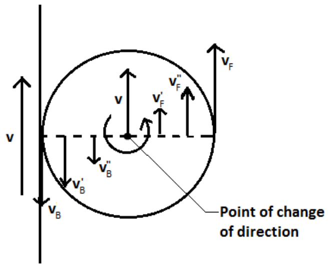
III. The discs are separated by the line of path which is also the tangent for both the opposite discs.

IV. On the direction of the motion of the body, the nearest of the objects seem to be travelling in the opposite direction to that of the body, and the farthest objects, as seen from the body's perspective seem to be travelling in the same direction as that of the body.

V. On the direction of the body, the nearest of the objects seem to be travelling opposite in a higher velocity and the objects in the farther sight of the objects seem to be travelling in a lower velocity.

VI. This phenomena gives the observer travelling in the body an illusion that the surrounding is in the form of a disc (seen from the edge).

VII. As the velocity of the objects in the surroundings gradually decreases from the nearest to the farthest, there is a point on the disc where the direction of the surrounding objects reverses from backwards to forwards.



VIII. The point at which the direction of the surrounding objects change, is the center of the disc of the surrounding.

IX. The center of the disc follows a translational motion. Whereas, the whole disc follows a rotational as well as translational motion.

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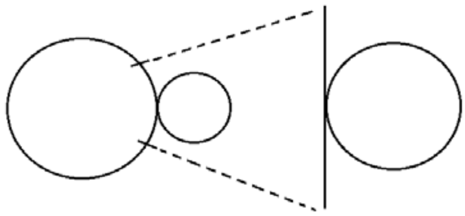
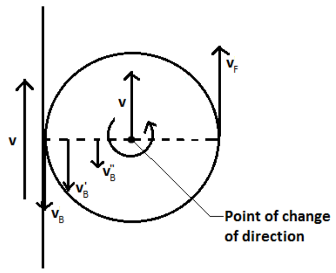
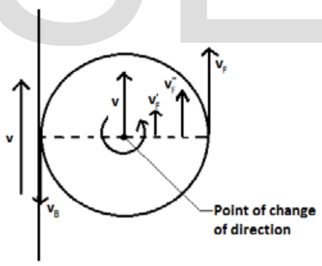


X. The whole concept originates from the situation where a body is seen travelling along the edge of a disc. The body will experience the same phenomena. Each small segment of the disc's path can be seen as a straight line which then explain the whole concept.



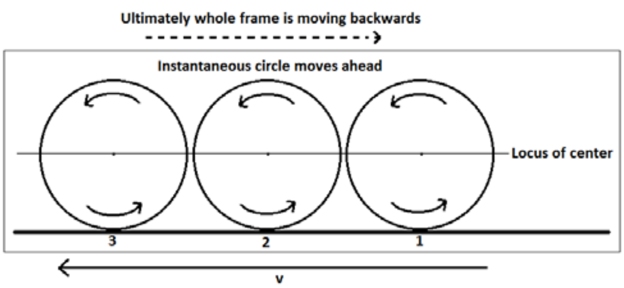
XI. The nearest object in the surrounding has the velocity 'v_B' and the farthest object in the surrounding has the velocity 'v_F'.

The velocity of the nearest objects relative to the travelling object is $v + v_B$ (opposite in direction).
The velocity of objects decreases as we get farther, hence,
$v + v_B > v + v_{B'} > v + v_{B''} > v$



XII. Similarly the velocity of the farthest objects relative to the travelling body is $v - v_F$ (same direction).
So, $v < v - v_{F''} < v - v_{F'} < v - v_F$.

Now if we consider the assumption by subtracting $v + v_B$ by $v - v_F$,
$v + v_B - v + v_F = 0 \rightarrow v_B = -v_F$
Hence proved that the assumption is correct. v_B and v_F both are of the same magnitude but are opposite in direction.



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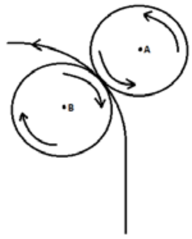
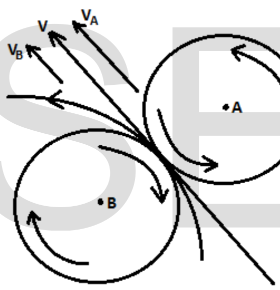
XIII. On considering a longer path of travel and at multiple instances, it can be seen that, although we see the discs moving forward in the direction of motion of the body, and the distant objects seem to be following the same direction, considering the frame for a definite interval of time, the objects actually move backwards.

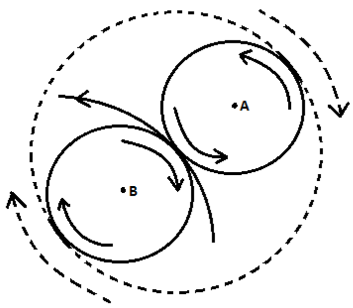
XIV. It should be noted that linear motion can also be seen as a curvilinear motion, as a line can be seen as an arc of an infinitely large circle, in which both the discs will have different velocities but the difference in velocities will tend to zero hence forming a linear path.



XV. The body on entering a curved path undergoes a very slight change in its behaviour. Considering the body taking a left turn, the outer disc, i.e. disc A travels faster than disc B and hence a curved path is formed by the body.



XVI. The body is seen taking a left turn and to make that turn, disc A has to travel faster than disc B. But how the surrounding objects actually behave can be understood by considering a tangent that runs along the discs A and B as well as through the arc of the turn the body is taking.
The tangent indicates the instantaneous velocity of the body 'v', 'v_A' being the velocity of the farthest object in disc A and 'v_B' being the velocity of the farthest object in disc B.



XVII. As, disc A is travelling faster than disc B, $v_A > v_B$.
From the above equation, subtracting v on both sides, we get,
$v_A – v > v_B – v$.
Now multiplying by -1 on both sides,
$v - v_B > v – v_A$.

Hence, we can understand that from the point of view of the body, farthest points of disc B are seemed to be travelling at a higher velocity than the farthest points of disc A. And the surroundings behave as it were a disc touching discs A and B both.