

## Re: Instantaneous radius of a rotation

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Atreides wrote:

But it is unnecessary. If the trajectory is  $u(t)$ , the

acceleration is  $u''(t)$ , and the required force is  $mu''(t)$ . The reaction (centrifugal) force is just opposite this.

Is that what you were after?

You are right. But this is only the magnitude of the force.

No... it's the whole thing ( $u$  and its derivatives are vectors).

Imagine that we have an aircraft, it's nose is pointing in the sky (e.g. pitch angle of 10 degrees) and it starts to bank for a turn.

The question is:

What is the direction vector of the centrifugal force ?

You've given both too much and not enough information. Let  $u = (x,y,z)$  be the position vector at the COM (center of mass) of the aircraft. The net force on the aircraft is  $mu''$ , where  $m$  is the mass,  $u''$  the second derivative of the position vector wrt time. The phrase "centrifugal force" will probably only confuse the issue, but if you mean the force a person would exert on a roller-coaster car while the car is following trajectory  $u$  with the person attached, it's just the opposite of this;  $-mu''$ , where  $m$  is the mass of the person.

Things get more complicated if the body has extension, and starts rotating.

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