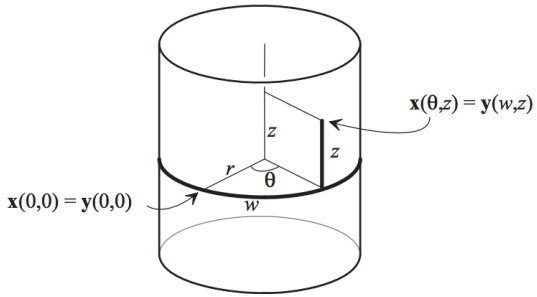
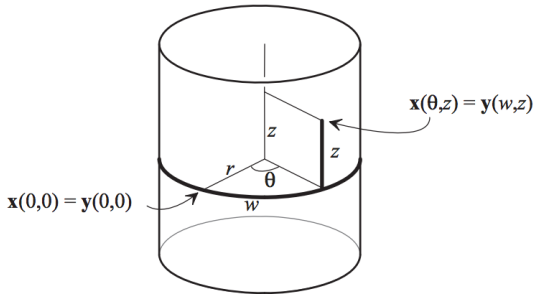
Coordinates on a Cylinder



- Choose (0,0,0), and 3 $\perp$ axes
- Choose +z as a cylinder height axis
- Let θ be the angle traveled from the origin in the *xy* plane

Coordinates on a Cylinder



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Extrinsic coordinates : $x(\theta, z) = (r\cos(\theta), r\sin(\theta), z)$

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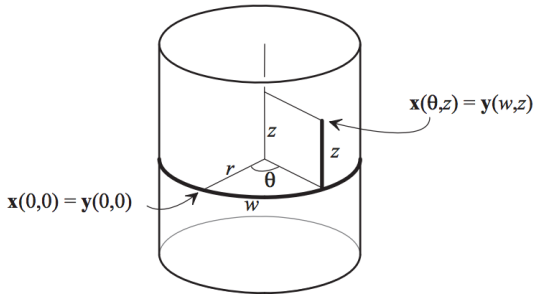

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Problem: Bug no awareness of 3-space

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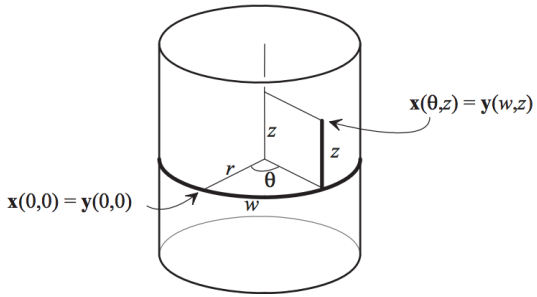

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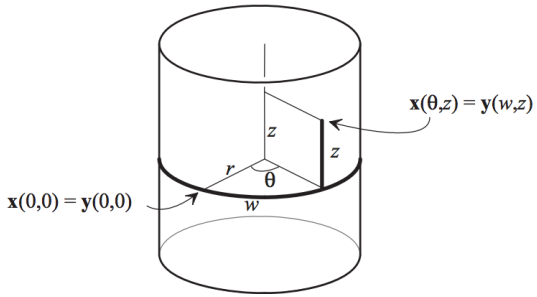

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- Choose (0,0) as an intrinsic origin. There is 1 geodesic that will return there, so call that the base curve

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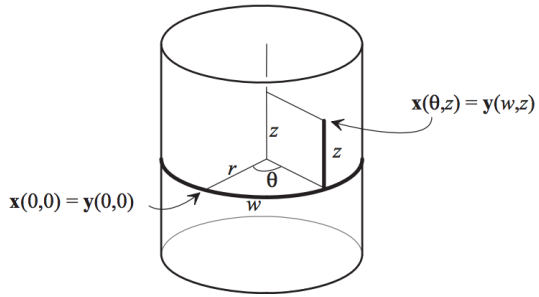

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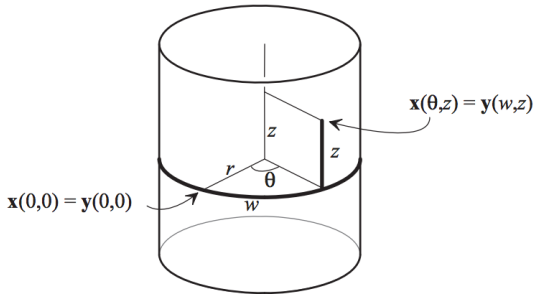
- Choose +z as a direction $\perp$ to the base curve

Coordinates on a Cylinder



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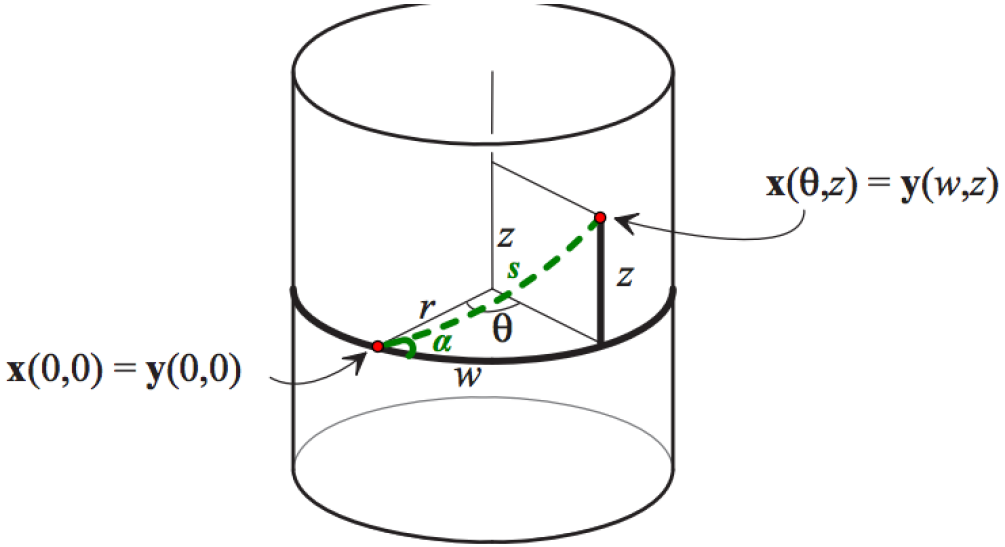
Intrinsic coordinates (geodesic rectangular coordinates) :
$y(w, z)$ = walk w units along base curve and turn 90 degrees to positive z-direction and travel z units.

Coordinates on a Cylinder



Extrinsic coordinates: $x(\theta, z) = (rcos(\theta), rsin(\theta), z)$
Equation of cylinder: $x^2 + y^2 = r^2$ in $\mathbb{R}^3$

Intrinsic coordinates:
Geodesic rectangular coordinates: $y(w, z)$ = walk w units along base curve and turn 90 degrees to positive z-direction and travel z units.

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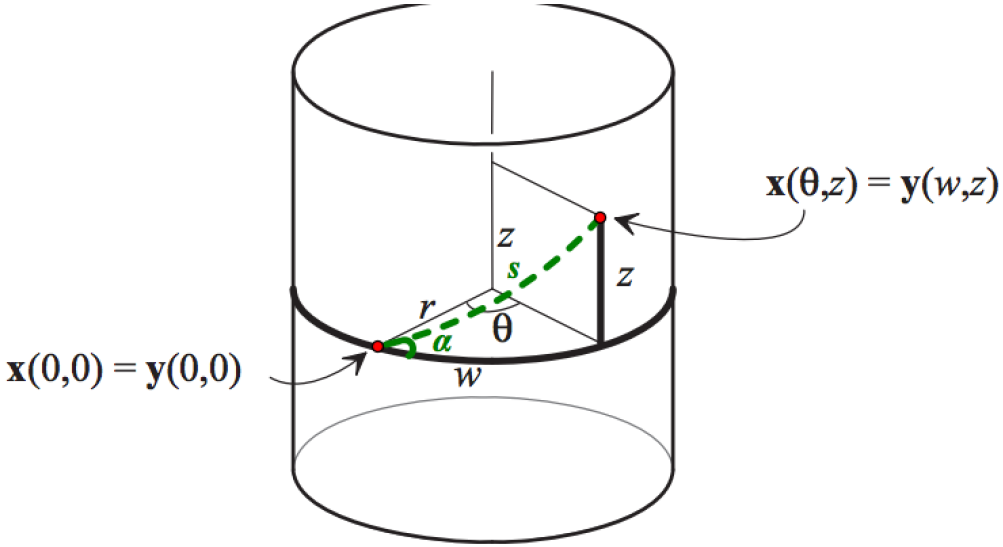

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Equation of cylinder: $x^2 + y^2 = r^2$ in $\mathbb{R}^3$

Intrinsic coordinates:
Geodesic rectangular coordinates: $y(w, z)$ = walk w units along base curve and turn 90 degrees to positive z-direction and travel z units.
Geodesic polar coordinates: $y(\alpha, s)$ = turn α degrees from the base curve and walk s units along that geodesic