

3D Time: From Transportation to Physics

Part 1: Show Me



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Time, space, and motion

- Motion is change –
 - of length|distance
 - of time|duration
- Motion has 3D –
 - 3D of length are space
 - 3D of *time* are *time*
- How can we show 3D time?
 - 2D maps



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A traveler's perspective



3

Speed and Distance



Speedometer

Travel speed

028638

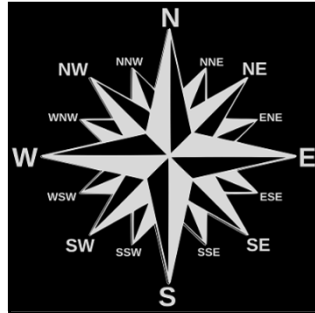
Odometer

Travel distance



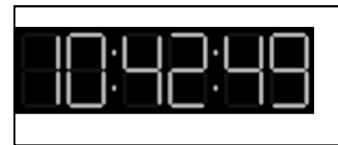
4

Direction and Time



Compass or GPS

Travel direction



Clock or watch

Travel time

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Then what do we know?

- *Travel speed*
- {

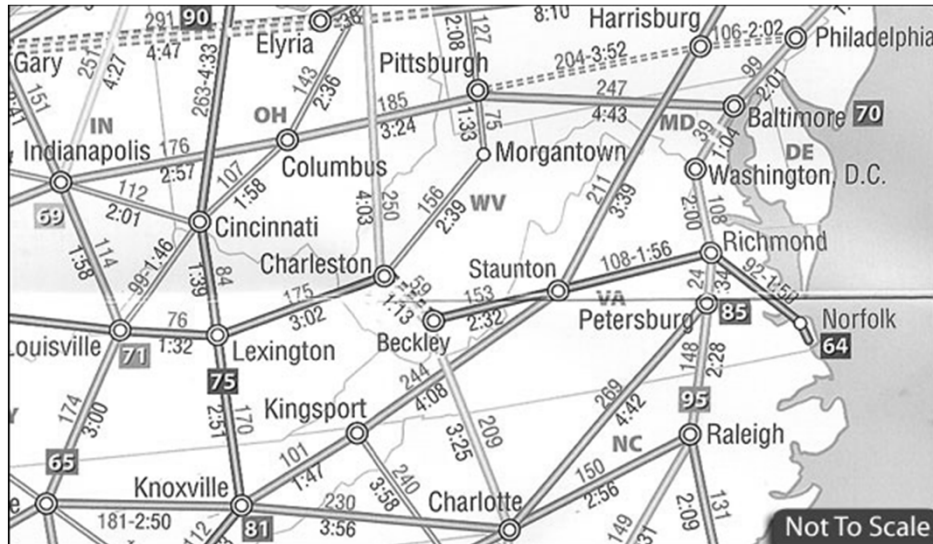
 - *Travel direction*
 - *Travel distance*
 - *Travel time*
- *Speed = distance per time*

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Drive time map

176
2:57



Miles
in red

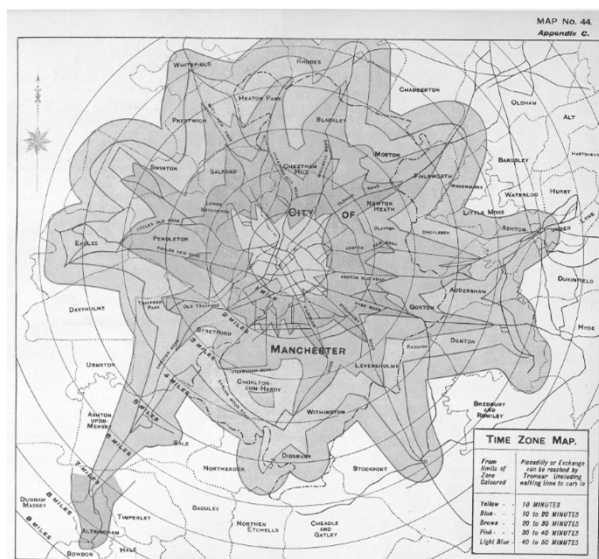
Hours
in blue

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Isochron map – travel times

Time
in 2D



TIME ZONE MAP.

From
limits of
Zone
Coloured

Piccadilly or Exchange
can be reached by
Tramcar (including
walking time to car) in

Yellow	10 MINUTES
Blue	10 to 20 MINUTES
Brown	20 to 30 MINUTES
Pink	30 to 40 MINUTES
Light Blue	40 to 50 MINUTES

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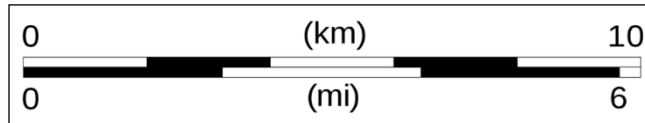
Map scales

- Relationship between the map and reality

- apply to 2D map

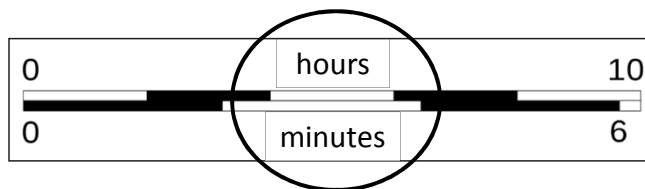
- Space scale

- map \leftrightarrow distance
- 1 cm = 2 km



- Time scale

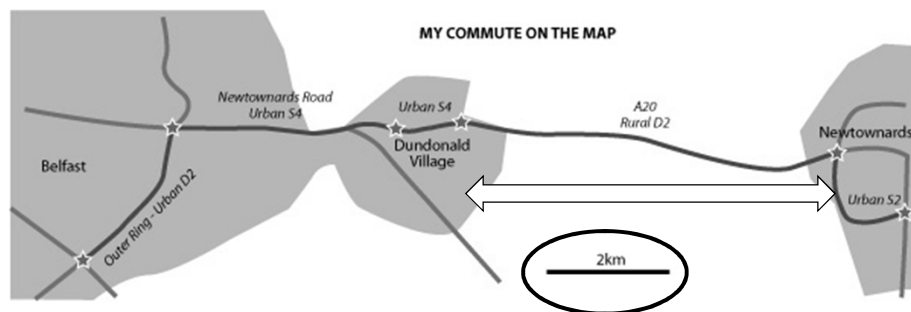
- map \leftrightarrow duration
- 1 cm = 4 minutes



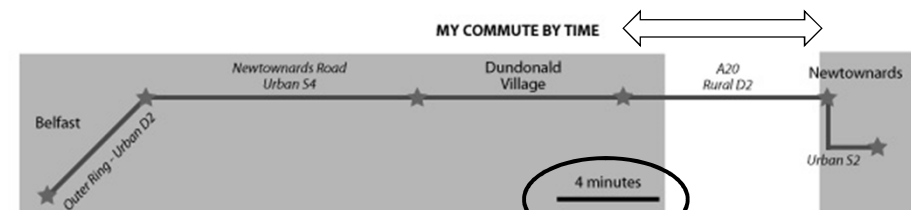
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Travel maps of space and time

Map of
space



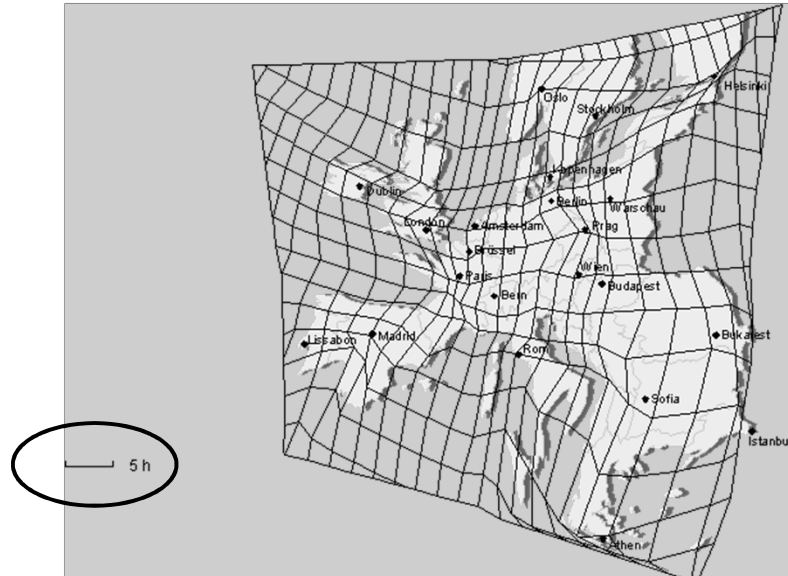
Map of
time



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European rail travel times

Time
in 2D



Looks
“distorted”

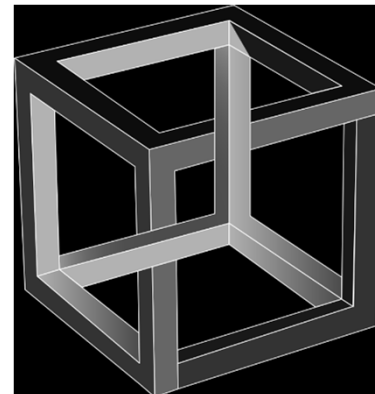
It’s 2D
time!

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Conclusion

- 2D maps
 - Show space if scale is distance
 - Show *time* if scale is *duration*
- Motion is 3D
 - 3D of distance
 - 3D of *time*
- “But 3D time is impossible!”
 - See *Part 2: Objections*



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