VBA and Orbits

Using VBA and AutoCAD to Calculate and Draw Planetary Orbits

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Abstract: Any gravitational hypothesis such as that based on the perpetual reduction in absolute density of all matter will require tests including comparison to Newtonian planetary orbit calculation. For the amateur this would require an inordinate amount of time and calculation. Visual Basic for Applications inside AutoCAD provides a powerful tool in such a case and will be demonstrated in this paper.

NOTE: More detailed material covered in this paper may be viewed by clicking on

http://edreidatbcit.blogspot.com/

Contents:

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1. *Milestone Planetary System Models*

1.1 **Ptolemaic** ***where direction is determined by crystal spheres and motive power is unknown or due to spirits.***

1.2 **Newtonian** ***where motive power is conserved momentum and direction is determined by*** $mg = GMm/R^2$

1.3 **Einsteinian** ***where motive power is conserved momentum and direction is determined by the curvature of space.***

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2. *Einstein's Model*

This is the most accurate model to date and possibly ever.

There is no *simple* explanation – compared to Newton's – for the curvature of space.

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3. *Possible Explanation for Curvature of Space*

If all matter in the universe undergoes a perpetual decrease in absolute mass density then the distance between objects in free fall will decrease without the need for Newton's gravitational force.

The hypothesis is...

Space is curved because it flows.

and...

The Arrow of Time is determined by this flow. Time may be warped but it is irreversible.

4. *If All Matter is in a State of Volumetric Expansion…..*

All measuring rods will be scaled in all dimensions – as will time due to *constancy of velocity of light and its fractions between zero and one*.

Any object embedded in space and which is stationary relative to an observer will be *observed* as accelerating towards that observer.

The observer will be unaware of his or her own upward scaling.

Either the observer is expanding or space is shrinking towards the observer.

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5. *Example from Literature…….*

The stained glass panel.

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6. *Analogy to Fluid Flow*

Very similar basic equations and methods are used by modellers of Groundwater, Heat Flow and Mechanical Stress.

Heat can be modelled as though it is an incompressible fluid although it has no property *in this context* other than volume.

Though Space has no property other than Volume, it can be modelled in the same way as Heat

or...

Incompressible Fluid Flow

7. *Method for testing this Hypothesis*

Whenever the above hypothesis is presented the question that immediately arises is *"Will it produce the same results, at least, as Newton's Model?"*

In order to answer this question it is necessary to find what the universal rate of change of mass density is.

In addition, *an* existing *solar system* must be modeled in order to provide a template against which to make a comparison as well as seed data to run the model being tested.

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8. *Applying VBA and AutoCAD to produce simple software to test the hypothesis*

The geometry of the orbits of planets is that of the ellipse.

Calculating the daily positions of planets requires the solution of Kepler's equation – relating time to angular position of a radius vector from the sun

$$E = M + e \sin E$$

Where *M* is mean and *E* is eccentric anomaly

This Equation is Transcendental and Notorious for instability of Numeric Solutions

But there's a simple reliable solution....

9. *Solution to Kepler's Equation Problem*

The following is a direct translation from BASICA coding by *Roger Sinnott* and listed in *Meeus:*

M is mean and E0 eccentric anomaly

```
F = Sgn(M)                          ' Preliminary variable and other
M = Abs(M) / 2# / Pi                ' declarations have been
M = (M - Int(M)) * 2# * Pi * F      ' omitted for clarity
If M < 0# Then M = M + 2 * Pi
F = 1
If M > Pi Then F = -1
If M > Pi Then M = 2# * Pi - M
E0 = Pi / 2#
D = Pi / 4#          '    (continued)
```

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9b *Continuation of Sinnott's Solution of Kepler's Equation............*

```
For J = 1 To 53   ' upper index may be increased for accuracy
   M1 = E0 - E * Sin(E0)
   E0 = E0 + D * Sgn(M - M1)
   D = D / 2#
Next J
E0 = E0 * F
End Sub
```

The above listed VBA procedure is used to draw planetary positions as AutoCAD point objects. This procedure is common to most of the software employed in this exercise.

(SINNOTT.DWG)

10. *Determining the value of Universal Absolute Mass Density Reduction*

The first operation in the exercise is to find the falls for nine planets for each of a number of days in their orbits.

A two body elliptical orbit plot is made for each planet and the data relating drops, or falls, to distances from the sun is recorded.

Use is made of a semi graphical solution to the problem of tangent directions by *Butikov* following the method by *Hamilton*

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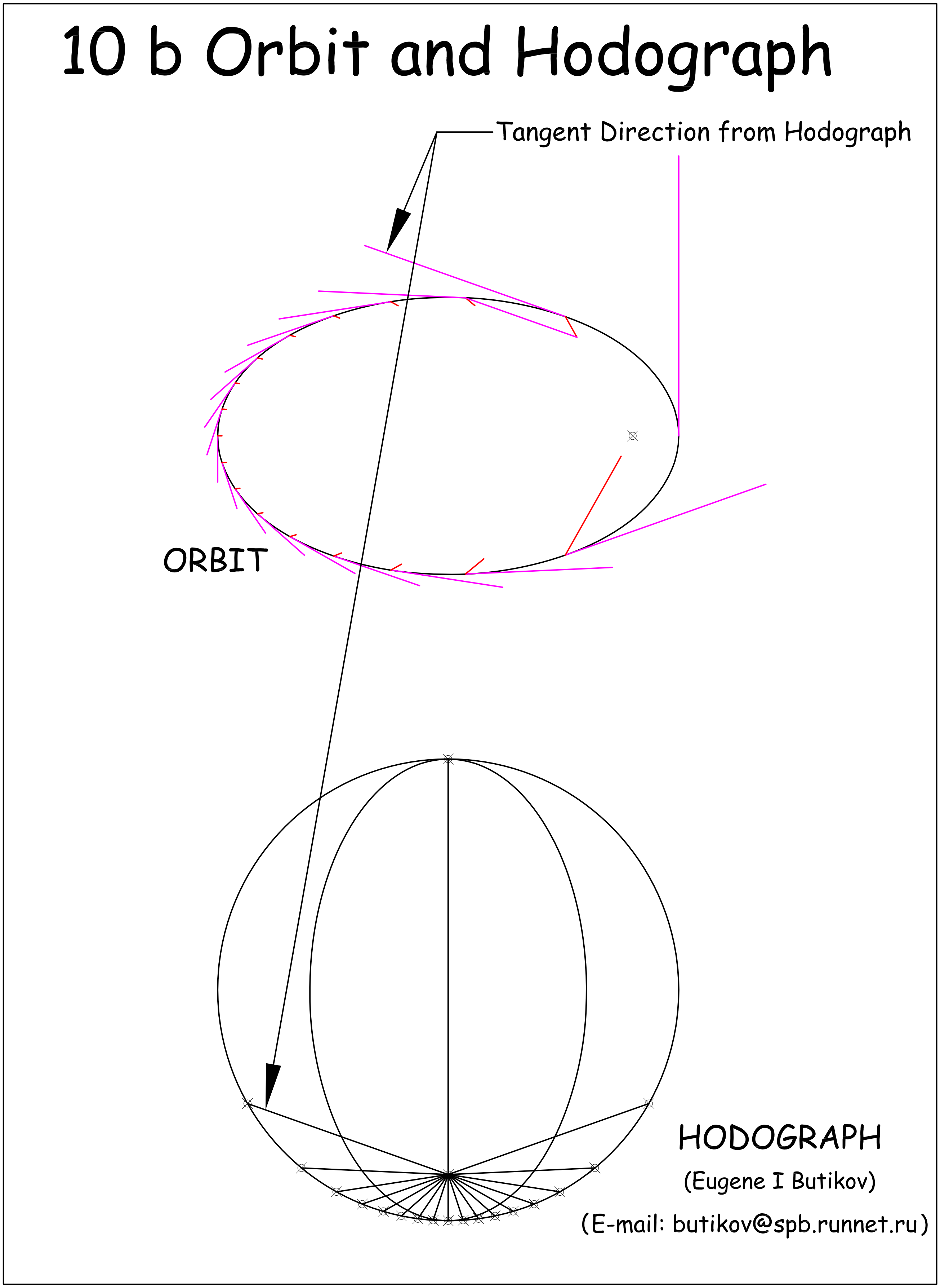
10 b Orbit and Hodograph



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10 c. *Determining the value of Universal Absolute Mass Density Reduction*

Employing the formulae described in the next two slides and least squares curve fitting in Excel provides a reasonable value.

Following the usual practice of modelling, this value may be recalibrated through test iterations.

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11. *The GOVERNING EQUATION for incompressible fluid flow is Q = AV*

Q has dimension $[L^3 / T]$

A has the dimension $[L^2]$ and.....

V has the dimension $[L / T]$

Rearranging....

$$V = Q / A$$

And for a sphere A is proportional to R^2

So that we may write

$$V = K / R^2$$

Which is analogous to

$$mg = GMm / R^2$$

12. *The formula $F = K / R^2$*

as a derivation from that on the previous slide, can be used to find *K* where *K* is the volumetric shrinkage of space per day per unit central mass, or sun, and *F* is the fall of the planet in question.

By plotting known orbits about the Sun and measuring the falls of planets according to positions in these orbits, the value of *K* may be obtained by least squares fitting of

$$Log(F) = log(K) - 2\ log(R)$$

13. *Method for calculating heliocentric Cartesian coordinates for a system of nine planets*

a. For each planet find coordinates on four separate days

b. For each planet's four X coordinates and using time as a parameter, find a cubic spline. *(CUBIC SPLINE.DWG)*

c. Find the tangent to the cubic spline of step b. at day five.

13 b. ***(cont...) Method for calculating heliocentric Cartesian coordinates for a system of nine planets***

d. **Repeat steps b to c for the Y and Z coordinates.**

e. **Find distance to the sun from these three XY and Z coordinates and using shrinkage factor of K found from formula** $\log(F) = \log(K) - 2\log(R)$ **move tangent position of planet on day five closer to sun.**

13 c. ***(cont..) Method for calculating heliocentric Cartesian coordinates for a system of nine planets***

f. **Discard coordinates for day one then move coordinates for days two to five backwards in the storage vectors to become the new coordinates for days one to four and so repeat the process.**

14. *Refinement of method to include perturbations*

A refinement of the general method of calculating orbits is carried out by treating each planet as well as the sun, in turn, as the centre to which space shrinks.

Each cycle of this calculation is completed by subtracting the coordinates of the sun from all coordinates and so restoring the sun's coordinates to zero