# KeTCindy/KeTCindyJS A Bridge between Teachers and Students

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2019.09.26 CASTR

**This work was supported by JSPS KAKENHI Grant Number 18K02948,18K02872.**

**Files of our talk can be downloaded from 190926CASTR at**

https://s-takato.github.io/talks/english/index.html

# What is KeTCindy?

# KETCindy= KETpic+ Cinderella2

- Teachers who use TEX desire to produce figures inserted to their teaching materials interactively and easily.
- KETCindy is a collaboration of KETpic developed mainly by Takato and Cinderella2 (Cindy), a DGS, to help them.
- KETCindy uses KETpic as TEX code generator and Cindy as GUI.

# Cindyscripts and KETCindy

- Cindy has programming language CindyScript.
- CindyScripts is a general language so easy to use.
- Moreover, it can handle other than geometric objects, which distingushes it from other DGS.
- KETCindy is a macro package of CindyScript.

# How KETCindy works

- KETCindy works as a kind of preprocessor of TEX graphical code systems(Tpic, pict2e,TikZ).
- It generates graphical data as follows:

  (1) Write scripts of KETCindy in CindyScripts.

  (2) Cindy changes the scripts to scripts of R.

  (3) R generates graphical data( .tex) of TEX.

- Insert it with TEX command "\input".

# How KETCindy works (Example)

- **Scripts of KETCindy**

```
Ketinit();Plotdata("1","sin(x)","x");Windispg();
```

- **Generated graphical data of pict2e for example**

```
{\unitlength=1cm%
\begin{picture}(12,4)(-6,-2)%
\linethickness{0.008in}%%
\polyline(-6.00000,0.27942)(-5.76000,0.49964)(-5.52000,0.69123)...
\polyline(-6.00000,0.00000)(6.00000,0.00000)%
   ...
\put(-0.0500000,-0.0500000){\hspace*{\Width}\raisebox{\Height}{0}}%
\end{picture}}%
```

movie

# Website of KETCindy

- We have launched a website for KETCindy.
  https://s-takato.github.io/ketcindy
- Search the site with keywords ketcindy samples.
- You can find many samples of KETCindy there.
- References of KETCindy are also downloadable.

# How to install KETCindy

- CTAN(Comprehensive TEX Archive Network) has uploaded KETCindy to the site in 2018.

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- Then you can download the package of KETCindy directly from ctan ketcindy.

# How to install KETCindy

- You can also download the latest version of KETCind from Repository
- Follow 'readme' in the folder 'ketcindy(-master)'.

  ReadmeWin

  ReadmeMac

  ReadmeLinux

# Softwares used by KETCindy

- Cinderella2
- R
- Maxima
- A TEX system

  TeXLive may be easy to install KETCindy.
- PDF viewer

  For windows, Sumatra is recommended.

# Examples of KETCindy

- s01 01figure, 06bowhatch
- s02 01figure, 06bowhatch, 10diffeq2
- s04 01basic, 02ospline
- s05 02spacecurve, 07polyhedron
- s09 03saddle, 08wiredata
- s10 02tangentialline

# KeTCindyJS

# CindyJS

- A group of Technical University of Munich has been developing CindyJS https://cindyjs.org.

  CindyJS is a framework to create interactive (mathematical) content for the web. It aims to be compatible with Cinderella, providing an interpreter for the scripting language CindyScript as well as a set of geometric operations which can be used to describe constructions.

- CindyJS itself doesn't support KETCindy, so it is not enough to produce many kind of teaching materials.

# Deveolpment of KETCindyJS

- Cinderella2 can export codes in CindyScripts and components in CindyScreen to a HTML file.
- We have developed KETCindyJS which make it possible to use many functions of KETCindy in the HTML file.
- You can find lots of samples at page samples of ketcindy.
- We show the simplest example with movie.

# How KETCindyJS produces HTML

**s02graphs**

# Samples of KeTCindyJS

# Simple examples

- Tangent of Sine
- Implicit Function
- 2nd-order Deq
- Rotate Triangle

# Animations

- Deqplot
- General Angle
- Hypotrochoid

# Inputbox

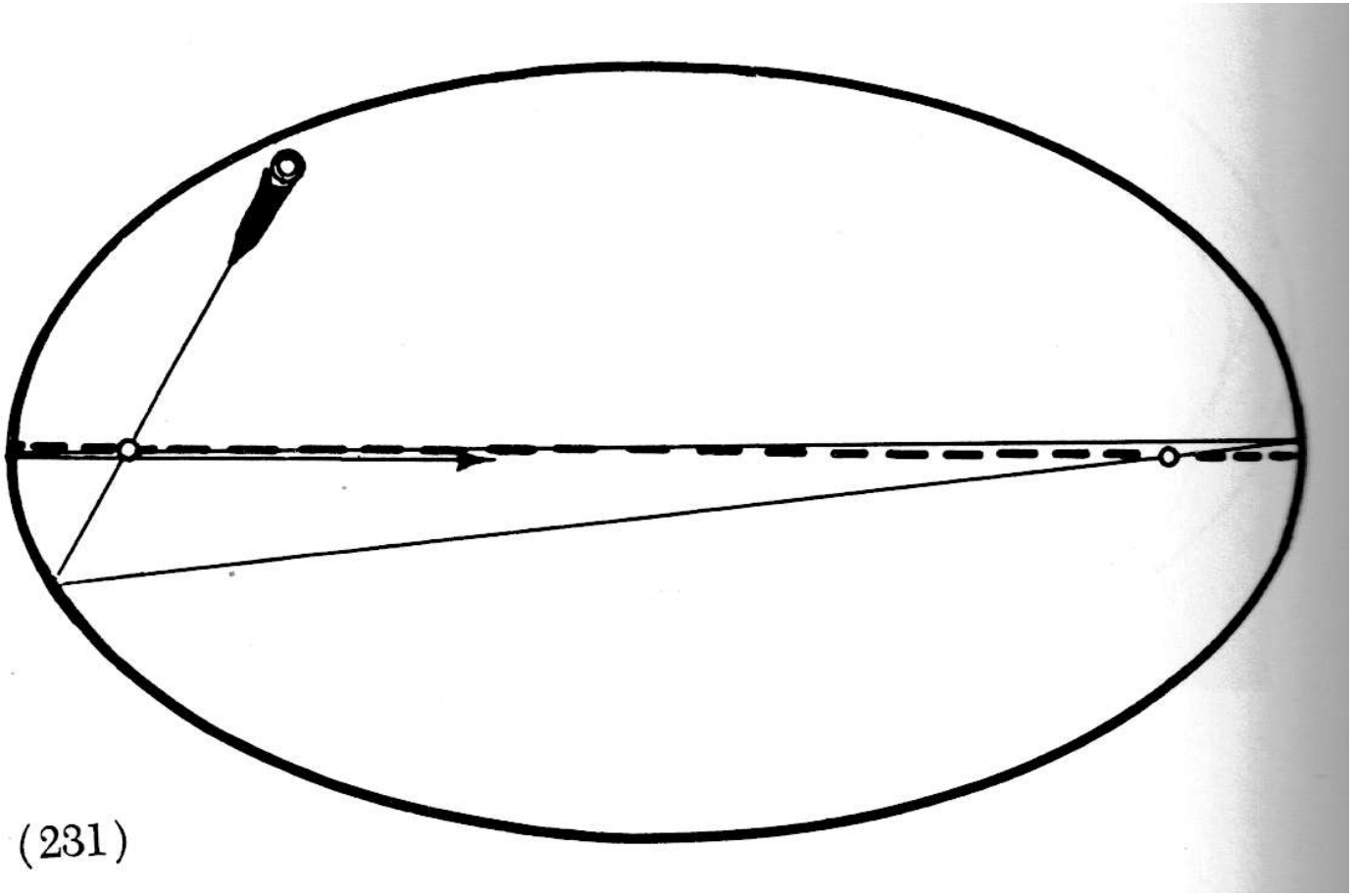
- Trignometric
- Napier's Constant
- Calc of sin,cos,tan

# Advanced Samples

- Rotataion of Cube
- Graph of sin(x)

# Using Maxima

# Elliptical Billiard



(231)

# Elliptical Billiard

Hugo Steinhaus

MATHEMATICAL SNAPSHOTS



s0612

# Fourier Series

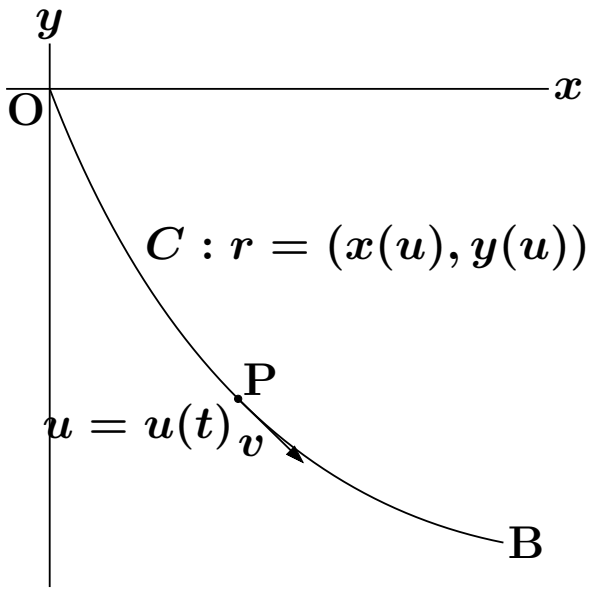
- **Vallejo-san has developed a package to find Fourier coefficients of piece-wise functions.**
- **An example**

```
defL=[
 "0",[-2,-1],1, "x",[-1,0],1,
 "x^2",[0,1],50, "1",[1,2],1 ];
```

- **s1010**

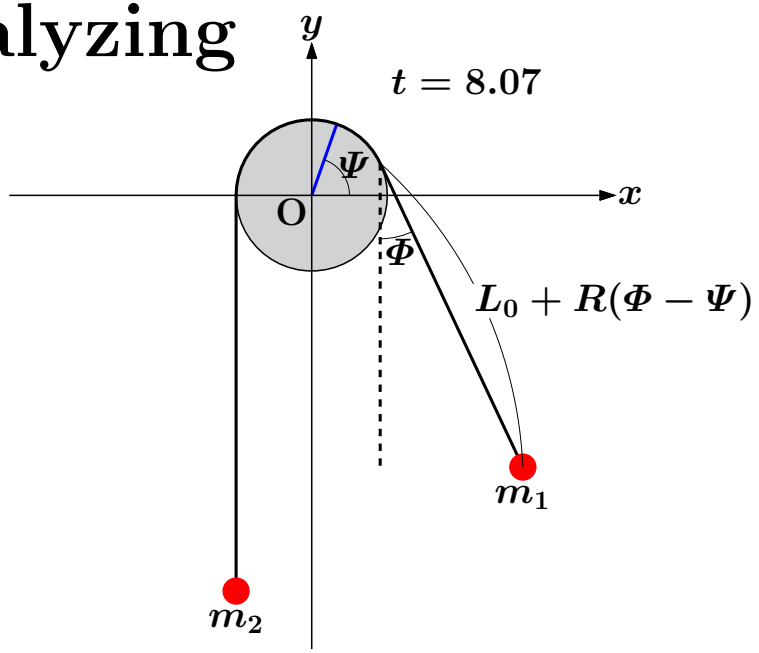
# Brachistchrone Curve

- What is the curve of the fastest descent?
- $\dfrac{du}{dt} = \sqrt{\dfrac{-2gy}{\dot{x}^2 + \dot{y}^2}}, \; u(0) = 0$
- $T = \displaystyle\int_0^U \sqrt{\frac{\dot{x}^2 + \dot{y}^2}{-2gy}}\, du$
- s1611



# Swinging Atwood's Machine

- Prokopenya-san has been analyzing various Atwood's machines.




- He obtained the Lagrangean:

$$\mathcal{L} = \tfrac{1}{2} m_1 (L_0 + R(\Phi - \Psi))^2 \dot{\Phi}^2$$
$$+ \tfrac{1}{2} (I_0 + (m_1 + m_2) R^2) \dot{\Psi}^2$$
$$- m_1 g (R \sin\Phi - (L_0 + R(\Phi - \Psi)) \cos\Phi)$$
$$+ m_2 g R \Psi$$

- From this,

$$\ddot{\Psi} = \frac{R\left(g\,(m_2 - \cos\Phi\, m_1) - \dot{\Phi}^2\,((\Phi - \Psi)\,R + L_0)\,m_1\right)}{R^2\,(m_2 + m_1) + I_0}$$

$$\ddot{\Phi} = \frac{-\sin\Phi\, g + 2\,\dot{\Phi}\,\dot{\Psi}\,R - \dot{\Phi}^2\,R}{(\Phi - \Psi)\,R + L_0}$$

s0614

# Conclusions

# KETCindyJS for education

- KETCindyJS has great potential to produce more interactive materials.
- As a result, it will accelerate communication between teacher(s) and students in the classes.
- For now, KETCindyJS can not call a CAS, which is a future work for us.

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