Review of New Features in Maple 2015

Summary

Many of the highlighted new features in Maple 2015, as in previous releases, appear heavily correlated with earlier features of *Mathematica*. Furthermore, the Maple feature is often only a shallow implementation of the *Mathematica* functionality.

Only a small fraction of *Mathematica*'s advances make it into Maple at all. For those that did, the average time lag between features being introduced in *Mathematica* and basic implementation in Maple 2015 was around ten years. Look at *Mathematica* 10.3 for what to expect in Maple's 2025 release!

New Features Timeline

Maple 2015	***Mathematica***	**Notes**
MapleCloud web access	2014	The capabilities of the MapleCloud remain far behind those of the Wolfram Cloud. MapleCloud does not support content creation, content editing, scheduled tasks, report generation, computational APIs, data accumulation, or programmatic control or offer a private version of its cloud. All of these capabilities and more are available in the Wolfram Cloud.
Data sets	2009	In 2009, Wolfram launched Wolfram|Alpha, a project to make the world's data computable. In the wake of Wolfram|Alpha, Quandl was set up in 2012 but with more limited technical aspirations. It does not attempt to unify different data sets with common entity names (e.g. country names, cities, animal taxonomies, etc.) and common unit systems. It does not attempt to integrate relevant computation into the data and does not attempt to provide natural language access. Maple's link to Quandl is limited to data search and retrieval; it has not attempted the deep integration with data provided by *Mathematica*. For example, data requests in *Mathematica* are provided with units interpretable by *Mathematica*. *Mathematica* unit conversions automatically use current values for currencies. Geo computations in *Mathematica* can take any geographic entity (e.g. a city, building, or mountain name) as specifications. Forms in *Mathematica* applications can have semantic restrictions (e.g. the user must enter country name), which are validated against data. *Mathematica* users can also make data available through Wolfram|Alpha through the Wolfram Data Drop. Data is deeply integrated into the Wolfram Language, not just importable. Of course, *Mathematica* users can also easily access Quandl data using the `Import` command.

Maple 2015	*Mathematica*	Notes
Polyhedral sets	2014	*Mathematica* contains a powerful geometric regions package, which supports arbitrary combinations of *n*–dimension discrete, parametric, or primitive defined regions. Polyhedral regions are one of the simplest subsets of this framework and can be created by using the *Mathematica* function `ImplicitRegion` with only linear constraints. While the properties calculated by Maple's Polyhedral Sets functions are not a strict subset of *Mathematica*'s region framework, the scope of regions is. Maple cannot represent non–convex regions, disjoint regions, or regions with curved edges.
Plot thumbnails in output	2007	*Mathematica*'s Computable Document Format (CDF) has a general symbolic content description that allows any displayable content to be embedded in any other content. Plots appearing in output is just one such example of this much more general principle. In contrast, Maple still cannot put a plot on the face of a button, buttons in graphics, images in combo–boxes, or many other combinations which are trivial in *Mathematica*.
Default point probe	2008	*Mathematica*'s graphics support the option `CoordinatesToolOptions`, which allows any content driven by any program to be dynamically displayed as a point probe, not just the four fixed choices that Maple now provides.
Trigonometric and hyperbolic functions palette		Since 1996, *Mathematica* has allowed users to create arbitrary palettes. This palette can be implemented in *Mathematica* with: `CreatePalette[Grid[Partition[PasteButton/@ {Sin,Cos,Tan,Sec,Csc,Cot,Sinh,Cosh,Tanh,Sech,Csch ,Coth,ArcSin,ArcCos,ArcTan,ArcSec,ArcCsc, ArcCot,ArcSinh,ArcCosh,ArcTanh,ArcSech, ArcCsch,ArcCoth,θ,π,ϕ,ω},4]]]`
Random variables palette		Since 1996, *Mathematica* has allowed users to create arbitrary palettes. This palette can also be implemented in *Mathematica* in a few minutes.
Content generation: layout elements	2007	*Mathematica* provides a full symbolic description for documents, allowing arbitary content generation, transformation, and analysis, not just generation. Every aspect of the content, layout, style, and interactivity is controllable, not just a subset of layout elements. *Mathematica* also provides a template system to make repeated automatic content generation even easier.
Content generation: embedded components and application authoring	2007	*Mathematica*'s full symbolic description for documents includes all interactive elements, allowing arbitary content generation, transformation, and analysis, not just generation.

Maple 2015	*Mathematica*	Notes
Content generation: the Tabulate command	2007	*Mathematica*'s `Grid` command allows much more control over tabular layout than Maple's Tabulate command, including individual cell level background color, size, alignment, and frame controls (not just whole grid settings). It supports horizontally and vertically spanning cells and vertical alignment. Maple supports none of these.
Data plots: many plots in one plot command		This function is a syntactic shortcut to existing plot types, all of which are supported in *Mathematica*.
Data plots: new intuitive calling sequences and support for different data types	1988	*Mathematica* has a unified data model so you do not need to worry about whether your data is a list, matrix, array, or any other type. The issue of competing similar data types still affects many other Maple functions, not just data plots.
Numerical solutions of ODE with delay	2008	Maple's numerical differential equation solvers still lack the finite element methods available in *Mathematica* that are needed to solve partial differential equations. Maple can only handle delay differential equations numerically. *Mathematica* can solve them symbolically as well.
Explore		*Mathematica* introduced the powerful `Manipulate` command for instant interface creation in 2007. Maple continues to incrementally develop functionality towards that offered by the initial release of `Manipulate` but still has a long way to go.
Explore: customizable interactive marker controls on 2D plots	2007	In Maple, the number of interactive markers is fixed by the author. In *Mathematica*, you can also allow users to add or remove markers interactively.
Explore: images on play/pause/loop animation controls	2007	In *Mathematica*, buttons and other UI elements can use any image, but in Maple, only pre–defined ones can be used.
Explore: 2D math for parameters with sliding controls	2007	In this context, it appears that Maplesoft means math characters (like α), rather than 2D math. In *Mathematica*, as well as arbitrary special characters, parameters can be labeled with any content, including full 2D typeset expressions (including fractions, roots, etc.) or images. In fact, you can put such content anywhere.
Explore: support for vertical orientation of slider controls	2012	*Mathematica*'s `Rotate` command, can display any control or other content with any angle of orientation, not just vertical and horizontal.
Explore: CheckBox controllers	2007	
Explore: startup code	2007	*Mathematica* also supports code that initializes when content that needs it is first displayed on screen. This allows you to avoid unnecessary code execution for content that is not viewed.

Maple 2015	***Mathematica***	**Notes**
Explore: document properties when launching as a new document	1996	While *Mathematica*'s `Manipulate` command was only added in 2007, the ability to generate interactive content in fresh windows and control the window properties has been available since 1996.
Finance: computing Greeks on derivatives	2010	Maple supports general Greeks calculations on the Black–Scholes model, while *Mathematica*'s `FinancialDerivative` command supports specific Greeks calculations on over 100 different financial derivatives contracts.
Grid computing: Run, Set, Get, GetLastResult, Wait, WaitForFirst	2008 (Available earlier as an add–on)	These functions are roughly equivalent to the *Mathematica* commands `ParallelSubmit`, `DistributeDefinitions`, `WaitNext`, and `WaitAll`. Maple still lacks some of the higher level functions that make *Mathematica*'s parallel programming so simple, such as `ParallelMap`, `ParallelTable`, and `SetSharedVariable`.
Sub–second current time	1996	
Group theory: group data	2010	Amongst the huge collection of datasets built into *Mathematica*, there is a searchable `GroupData` database with over 50 properties of several hundred finite groups.
Group theory: CayleyGraph	2010	
Group theory: IsCyclic	2010	*Mathematica*'s `Cycles` command fully enumerates cycles.
Group theory: ComplexProduct	2010	For permutation groups, this is provided in *Mathematica* by `PermutationProduct`.
Group theory: ElementOrder	2010	For permutation groups, this is provided in *Mathematica* by `PermutationOrder`.
Import/export	1996	Maple has now followed *Mathematica*'s design of having automated generic `Import` and `Export` commands, which can import different kinds of data automatically. However, *Mathematica*'s `Import` and `Export` commands support over 185 different formats, while Maple's supports only 51 formats. Furthermore, many of the *Mathematica* import and export filters provide additional options. For example, when importing a JPEG into *Mathematica*, you can choose whether you are importing an image, the image data, or the EXIF and other meta–data (such as camera shutter speed, image capture date, image device name, etc.).
Import/export: MathML	1999	
Import/export: FASTA	2007	

Maple 2015	*Mathematica*	Notes
Import/export: GenBank, SHP	2008	
Import/export: KML	2010	*Mathematica* provides import and export of KML. Maple provides only import.
Import/export: JSON, GPX	2010	
Import/export: Graphlet, GraphML, GXL, Pajek, and TGF	2010	
Import/export: FASTQ	2012	
Integrate		*Mathematica* has extremely powerful symbolic integration. All examples given in Maplesoft marketing materials as newly solved in Maple 2015 are already solved by *Mathematica*.
Embedded components: speaker component	1992	*Mathematica* documents can contain MIDI sound as well as waveform sounds. Maple supports only waveform sounds.
Embedded components: microphone component	2007	As well as being able to capture sound from a GUI component, *Mathematica* can also capture images from a webcam or other imaging device.
Embedded components: gauges, set initial angle	2012	
Embedded components: gauges, set range	2012	
Math functions: coulditbe		This functionality is part of the `Reduce` function in *Mathematica*, which also solves broader classes of quantifier elimination problems.
Embedded components: ListBox	2012	This is supported as `ListPicker` in *Mathematica*. In *Mathematica* elements of the `ListPicker` can be images, 2D typeset math, or other content, not just text.
Embedded components: Meter, Rotary Gauge, Volume Gauge, Plot, Text, Radiobutton, and Components programmatic setting	2007	All *Mathematica* interactive and static components can be programmatically set or changed.
Embedded components: resizable slider	2007	In *Mathematica*, most interactive components can be made arbitrary sizes. Slider is no exception.

Maple 2015	*Mathematica*	Notes
Bifurcation maps	1996	While not a named function in *Mathematica*, bifurcation plots are sufficiently simple that they have existed as examples in the documentation of *Mathematica* since 1996.
Math apps	2007–Present	In 2007, Wolfram launched the Wolfram Demonstrations Project as a home for all kinds of interactive demonstrations and math apps. In this release, Maple has added approximately 60 new math apps to total around 400. In the same amount of time, thanks partly to the easy authoring made possible by *Mathematica*'s `Manipulate` command, demonstrations.wolfram.com has grown by over 300 apps to total more than 10,000.
Special functions identities	2002	Wolfram Research makes its database of functions available for free at functions.wolfram.com. It currently contains over 300,000 formulas relating to more than 320 special and elementary functions. *Mathematica* 10.3 added programmatic access to this database to the Wolfram Language.
Statistical reference tables	N/A	Computational software should remove the need for reference tables. If you really want printed statistical reference tables, then they would be easy to produce in *Mathematica* by using the `Grid` and `Table` commands.
Units: temperature object	1992	Units, including temperature units, were first included in *Mathematica* in 1992. Since 2012, *Mathematica*'s units have been handled automatically in data plots, solvers, optimization routines, and more. They handle live data units (such as currency rates) and time–based units (such as currency rates). *Mathematica*'s use of Wolfram|Alpha linguistics allows entry of units in any format (e.g. "kph," "kilometers per hour," etc.). Maple's units system does not do any of these.
Visualization: shading between two curves	2007	*Mathematica*'s `Filling` allows shading between any combination of curves, axes, and plot boundaries, not just between two curves.
Visualization: empty plots	1988	
Visualization: pointline style	2007	
Visualization: color schemes for curves	2007	As well as allowing you to define custom color schemes, as Maple now does, *Mathematica* provides more than 170 pre–designed color schemes. These are designed for different aesthetic choices, standard interpetations (e.g. heat map), continuous gradients, and indexed discrete collections.
Robust regression	2007	Use of the `NormFunction` option within `FindFit` allows for several robust fitting approaches. Loess fitting has been available as a free package since 1998.

New features of Maple which are not, at least in part, following *Mathematica* capabilities focus on ordinals, general relativity functions, bivariate limits, and new code generation targets.
For more comparison information, see
www.wolfram.com/mathematica/compare-mathematica/compare-mathematica-and-maple.html.