NOME DO ALUNO A

EXEMPLO DE TRABALHO DE CONCLUSÃO DE CURSO

Trabalho de Conclusão de Curso de graduação, apresentado à disciplina de Trabalho de Conclusão de Curso 2, do Curso de Engenharia Elétrica da Coordenação de Engenharia Elétrica - CO-ELT - da Universidade Tecnológica Federal do Paraná - UTFPR, Campus Pato Branco, como requisito parcial para obtenção do título de Engenheiro.

OrientadorProf. Dr. Carl Sagan

Co-orientadora: Marie Curie

PATO BRANCO

2013

TERMO DE APROVAÇÃO

O Trabalho de Conclusão de Curso intitulado Exemplo de Trabalho de Conclusão de Curso foi considerado **APROVADO** de acordo com a ata da banca examinadora N$^\circ$ 123 de 2013.

Fizeram parte da banca examinadora os professores:

Prof. Dr. Carl Sagan

Marie Curie

Prof. Dr. Stephen Hawking

Dr. Brian Greene

Prof. Dr. Michio Kaku

Prof. Richard Feynman

DEDICATÓRIA

Aqui vai o texto da dedicatória. Aqui vai o texto da dedicatória. Aqui vai o texto da dedicatória.

Acreditar é mais fácil do que pensar. Daí existem muito mais crentes do que pensadores.

Bruce Calvert

AGRADECIMENTOS

Aqui são os agradecimentos.

RESUMO

Escreva aqui o texto de seu resumo... UTFPRTEX

Palavras-chave: LATEX, formatação de textos, exemplos.

ABSTRACT

Write here the English version of your Resumo...

Keywords: LaTeX, text formatting, examples.

LISTA DE FIGURAS

LISTA DE TABELAS

LISTA DE ABREVIATURAS E SIGLAS

DMA	.
EASREFER	Teste da lista de siglas 2. Esta possui um significado bem grande que ocupa mais de uma linha.
ER	Teste da lista de siglas 3.
SQPNA	Sigla em Que os Parênteses Não Aparecem .
TDLS1	Teste da lista de siglas 1.

LISTA DE SÍMBOLOS

ϕ	
$\vec{\alpha}$	alpha
$\upsilon\omega\psi_{n-1}^{jk}$	Função de teste da lista de símbolos. Está é uma descrição longa para um único símbolo
∇	Gradiente
$\upsilon\omega\psi_{n-1}^{jk}$	teste

SUMÁRIO

1 CASSINI FINDS HYDROCARBON RAINS MAY FILL TITAN LAKES

CASSINI IMAGING CENTRAL LABORATORY FOR OPERATIONS Posted: January 29, 2009

Recent images of Titan from NASA's Cassini spacecraft affirm the presence of lakes of liquid hydrocarbons by capturing changes in the lakes brought on by rainfall. For several years, Cassini scientists have suspected that dark areas near the north and south poles of Saturn's largest satellite might be liquid-filled lakes. An analysis published today in the journal Geophysical Research Letters of recent pictures of Titan's south polar region reveals new lake features not seen in images of the same region taken a year earlier. The presence of extensive cloud systems covering the area in the intervening year suggests that the new lakes could be the result of a large rainstorm and that some lakes may thus owe their presence, size and distribution across Titan's surface to the moon's weather and changing seasons.

The high-resolution cameras of Cassini's Imaging Science Subsystem have now surveyed nearly all of Titan's surface at a global scale. An updated Titan map, being released today by the Cassini Imaging Team, includes the first near-infrared images of the leading hemisphere portion of Titan's northern "lake district"captured on Aug. 15-16, 2008. (The leading hemisphere of a moon is that which always points in the direction of motion as the moon orbits the planet.) These ISS images complement existing high-resolution data from Cassini's Visible and Infrared Mapping Spectrometer (VIMS) and RADAR instruments [1].

Such observations have documented greater stores of liquid methane in the northern hemisphere than in the southern hemisphere. And, as the northern hemisphere moves toward summer, Cassini scientists predict large convective cloud systems will form there and precipitation greater than that inferred in the south could further fill the northern lakes with hydrocarbons.

Some of the north polar lakes are large. If full, Kraken Mare – at 400,000 square kilometers – would be almost five times the size of North America's Lake Su-

[1] Nota de rodapé. Teste

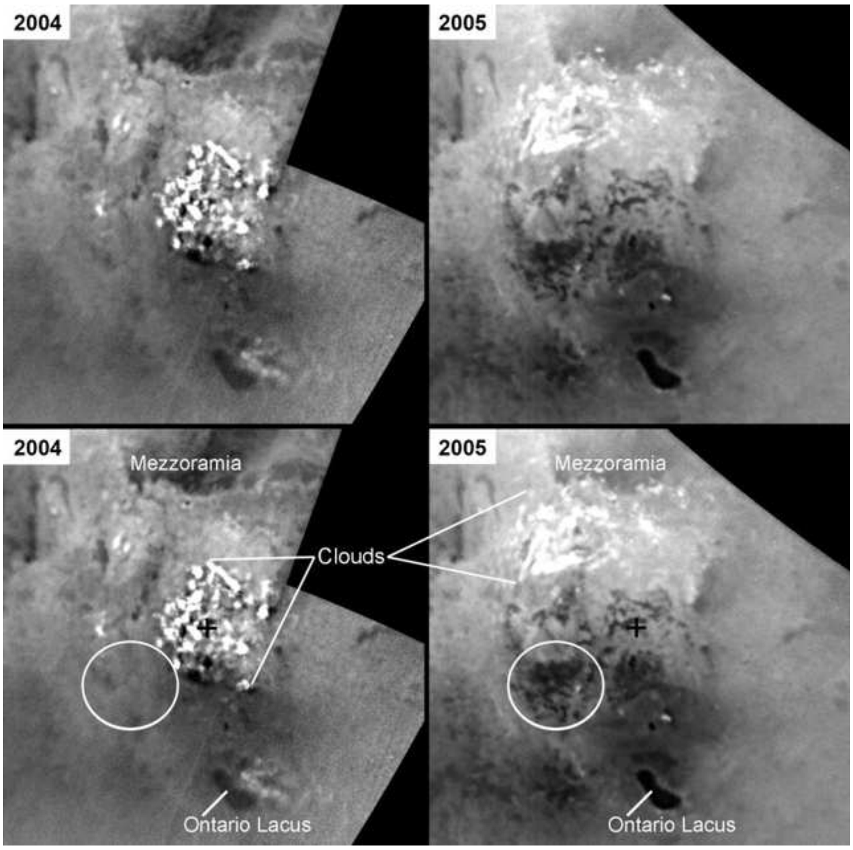

Figura 1: These mosaics of the south pole of Saturn's moon Titan, made from images taken almost one year apart, show changes in dark areas that may be lakes filled by seasonal rains of liquid hydrocarbons. Credit: NASA/JPL/Space Science Institute.

perior. All the north polar dark "lake" areas observed by ISS total more than 510,000 square kilometers – almost 40 percent larger than Earth's largest "lake", the Caspian Sea.

However, evaporation from these large surface reservoirs is not great enough to replenish the methane lost from the atmosphere by rainfall and by the formation and eventual deposition on the surface of methane-derived haze particles.

"A recent study suggested that there's not enough liquid methane on Titan's surface to resupply the atmosphere over long geologic timescales", said Dr. Elizabeth Turtle, Cassini imaging team associate at the Johns Hopkins University Applied Physics Lab in Laurel, Md., and lead author of today's publication. "Our new map provides more coverage of Titan's poles, but even if all of the features we see there were filled with liquid methane, there's still not enough to sustain the atmosphere for more than 10 million years".

Combined with previous analyses, the new observations suggest that underground methane reservoirs must exist.

Titan is the only satellite in the solar system with a thick atmosphere in which a complex organic chemistry occurs. “It’s unique”, Turtle said. “How long Titan’s atmosphere has existed or can continue to exist is still an open question”.

That question and others related to the moon’s meteorology and its seasonal cycles may be better explained by the distribution of liquids on the surface. Scientists also are investigating why liquids collect at the poles rather than low latitudes, where dunes are common instead.

“Titan’s tropics may be fairly dry because they only experience brief episodes of rainfall in the spring and fall as peak sunlight shifts between the hemispheres”, said Dr. Tony DelGenio of NASA’s Goddard Institute for Space Studies in New York, a co-author and a member of the Cassini imaging team. “It will be interesting to find out whether or not clouds and temporary lakes form near the equator in the next few years”.

Titan and the transformations on its surface brought about by the changing seasons will continue to be a major target of investigation throughout Cassini’s Equinox mission.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency (ESA) and the Italian Space Agency. The Jet Propulsion Laboratory (JPL), a division of the California Institute of Technology in Pasadena, manages the Cassini-Huygens mission for NASA’s Science Mission Directorate, Washington. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging team consists of scientists from the U.S., England, France, and Germany. The imaging operations center and team leader (Dr. C. Porco) are based at the Space Science Institute in Boulder, Colo. The Applied Physics Laboratory, a division of Johns Hopkins University, meets critical national challenges through the innovative application of science and technology.

1.1 SEÇÃO DE TESTES

Exemplo de citação longa:

> The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency (ESA) and the Italian Space Agency. The Jet Propulsion Laboratory (JPL), a division of the California Institute

of Technology in Pasadena, manages the Cassini-Huygens mission for NASA's Science Mission Directorate, Washington.

1.1.1 TESTES E EXEMPLOS DE LISTA DE SIGLAS

Testes da lista de siglas:

(TDLS1).

(EASREFER).

(ER).

Esta é uma sigla em que os parênteses não aparecem: SQPNA.

(DMA).

É preciso rodar duas vezes o Latex para que a lista de siglas seja atualizada.

1.1.2 TESTES E EXEMPLOS DE LISTA DE SÍMBOLOS

$$\phi = \vec{\alpha} \otimes \upsilon\omega\psi_{n-1}^{jk} \tag{1}$$

Onde:

ϕ: Angulo phi.

$\vec{\alpha}$: Alfa.

$\upsilon\omega\psi_{n-1}^{jk}$: Um simbolo grande.

Este símbolo (∇) foi inserido no texto, fora do ambiente *equation*.

$\upsilon\omega\psi_{n-1}^{jk}$

1.1.3 EXEMPLOS DE CITAÇÃO DE REFERÊNCIAS BIBLIOGRÁFICAS

(GRAINGER; STEVENSON, 1994)

(ANDERSON; FOUAD, 1977; GLOVER; SARMA, 2002)

Conforme Frasson (2003) a metodologia proposta é, bla bla bla...

REFERÊNCIAS

ANDERSON, P. M.; FOUAD, A. A. **Power System Control and Stability**. Ames, USA: The Iowa State University Press, 1977. 464 p.

FRASSON, M. V. S. **Classe ABNT. confeção de trabalhos acadêmicos em LaTeX segundo as normas ABNT**. [S.l.], 2003. Disponível em: <http://abntex.codigolivre.org.br>.

GLOVER, J. D.; SARMA, M. S. **Power System Analysis and Design**. 3. ed. Pacific Grove, USA: Brooks/Cole, 2002. 656 p.

GRAINGER, J. J.; STEVENSON, W. D. **Power System Analysis**. New York, USA: McGraw-Hill, Inc., 1994. 787 p.

ANEXO A - STELLAR MYSTERY SOLVED, EINSTEIN SAFE

For more than 30 years, Villanova University astronomer Ed Guinan has been plagued, puzzled, and perplexed by DI Herculis. On the surface, this binary star seems pretty much like any other binary star, with two stars going 'round and 'round each other in a predictable, orderly fashion. But there remained a nagging problem that as much as Guinan wanted, he couldn't just sweep under the rug: DI Her was not behaving in accordance with Einstein's general theory of relativity.

Figura 2: The binary star DI Herculis consists of two B stars separated by about one-fifth the Earth-Sun distance. Both stars are about 5 times the mass of our Sun. No artist's rendition, like the one shown here, can possibly portray the fact that these stars have about 50 times the surface brightness ϕ of the Sun. *Michael Carroll*

Every year, Guinan and his colleagues would observe the 8.5 - magnitude star. The two stars orbit each other in a plane lined up perfectly with Earth's line of sight, and they eclipse each other every 10.55 days. Thanks to these eclipses, which have been recorded since 1900, Guinan could make exceedingly precise measurements of the stars' masses, sizes, luminosities, and orbital characteristics.

Almost every known aspect of the system was hunky-dory. The stars are exactly as massive, large, and bright as theory predicts. But in a series of published papers, Guinan and his Villanova colleague Frank Maloney kept pointing out that the orbit was not behaving in accordance with general relativity, the cornerstone for modern science's understanding of gravity.

For years, Guinan looked for a third star in the system, or some other factor that could be throwing the orbit out of whack, but to no avail. The point in the orbit at which the two stars come closest continues to advance (precess) each orbital cycle at a rate only one-fourth the amount theory predicts. Guinan continually receives mail from armchair theorists who attempt to explain DI Her's anomalous precession with alternative theories of gravity.

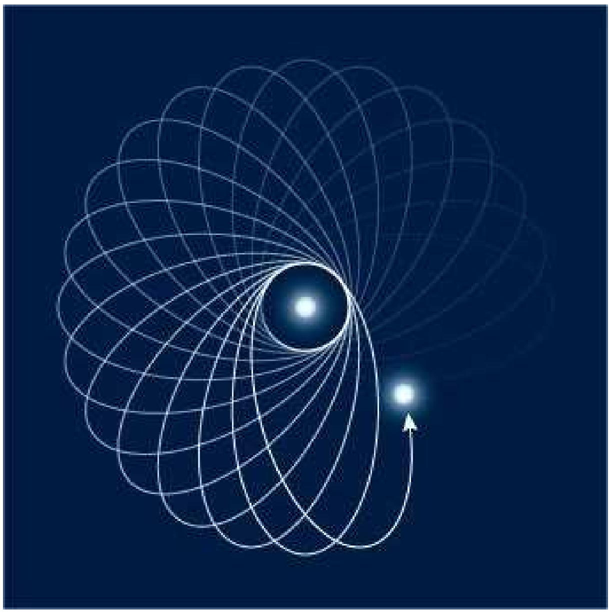

Figura 3: This illustration shows the precession in DI Herculis. The point at which the two stars come closest (periastron) in their mutual orbit advances (precesses) from orbit to orbit. But the amount of precession in DI Her is less than what theory predicted. The illustration is not to scale. *S&T: Casey Reed*

Finally, after decades of frustration, a group led by Simon Albrecht (MIT) has solved the problem, and Einstein's theory has survived unscathed. "The monkey has been lifted off my back,"jokes Guinan.

After being informed about DI Her by Guinan, Albrecht and his colleagues took detailed spectra in 2008 using a 1.93-meter telescope in France. These measurements, unlike earlier ones made by Guinan and others, were obtained with a high-resolution spectrograph. With more modern equipment, computers, and techniques, Albrecht revealed that the rotation axes of the two stars are tipped over on their sides with respect to the orbital plane (similar to Uranus's orientation with respect to the Sun), which makes DI Her an oddity among closely separated binary stars.

In this unusual arrangement, gravitational forces created by the misaligned equatorial bulges of the stars give them an extra ”kick”when they are closest in their elliptical (oval-shaped) orbits. This kick reduces the orbital precession to the observed rate, eliminating any discrepancies with Einstein’s theory. ”We consider the mystery of the anomalous orbital precession of DI Herculis to be solved,”says Albrecht, whose paper will appear in tomorrow’s *Nature*.

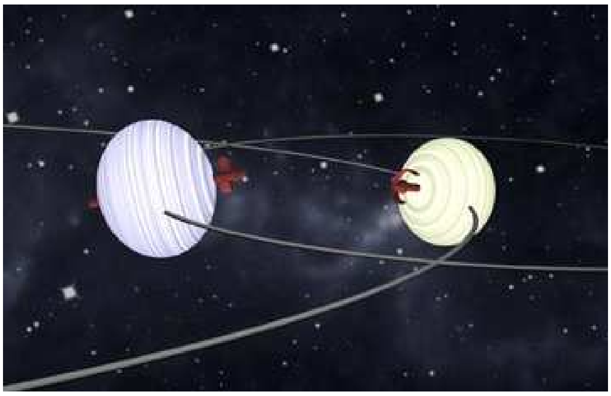

Figura 4: This illustration demonstrates how the equatorial bulges of the two stars in DI Herculis are nearly perpendicular to the binary’s orbital plane. This unusual configuration explains why DI Her’s orbital precession is not in accordance with theoretical predictions. *Simon Albrecht*

Guinan concurs, but he adds, ”I’m relieved that the general relativity problem is solved. But it’s been replaced with a new mystery.”

DI Her’s two members, both hot, massive, B-type stars, should have formed from a common disk of gas and dust. By feeding from the same disk, the spin axes of the two stars should be nearly perpendicular to the orbital plane, an arrangement seen in the large majority of binary stars, especially those like DI Her that have small separations.

”My guess is that there was a third-body interaction that perturbed the system, or the two stars formed separately and formed a binary through a capture process,”says Guinan. ”Another possibility is that our ideas of how binaries form may be off.”

Together with MIT colleague Joshua Winn, Albrecht is observing other binary systems that display similar anomalies. ”We want to understand if DI Her is a unique system or if misalignment is more common among close systems,”says Albrecht. ”We also want to understand what might cause this misalignment. Clearly, there is more going on then we guessed so far.”

Even if Einstein’s theory remains safe and sound, astronomers and physicists continue to subject it to more stringent tests. Given general relativity’s incompatibility with quantum mechanics (the theory that describes the microworld of atoms and light with extraordinary accuracy), scientists expect that Einstein will not have the last word on gravity. Ultimately, it will be replaced by an even deeper ”theory of everything.”

A.1 EXEMPLO DE SEÇÃO ANEXO

Esta é uma seção, dentro dos anexos.