Abstracts

An introduction to contact toric manifolds

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We study contact manifolds obtained through the contact reduction method, initially demonstrated by Geiges and promoted by himself, E. Lerman among others. This result has its essence in the symplectic reduction theorem demonstrated by K. R. Meyer in 1973 and independently by J. Marsden and A. Weinstein in 1974. Both contributions to classical mechanics led to the search of generalization of these results to the contact case over the last few years. Therefore, a lot of attention is paid to the type of group of automorphisms that will act in the study manifold, with the aim of finding more information on the structure of the manifolds obtained after the reduction. The particularity in the examples that we will develop will be that the group acting in many cases will be a torus of a certain dimension, which will generate the so-called *contact toric manifolds*

Geometrical aspects of corank 1 surfaces in $\mathbb{R}^4$

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We study the geometry of surfaces in $\mathbb{R}^4$ with corank 1 singularities. At the singular point we define the curvature parabola using the first and second fundamental forms of the surface. Also, we prove that, in a sense, the curvature parabola contains all the local second order geometrical information of the surface. The definitions of some geometrical features are given, such as asymptotic and binormal directions and umbilic curvature. Finally, we relate the geometry of the corank 1 surface in $\mathbb{R}^4$ with the one of an associated regular surface in $\mathbb{R}^4$. These definitions and results can be found in (P. BENEDINI RIUL, R. OSET SINHA and M. A. S. RUAS, The geometry of corank 1 surfaces in $\mathbb{R}^4$. arXiv:1801.06380, 2018).

The results are part of my PhD thesis supervised by M. A. S. Ruas and R. Oset Sinha.

Darboux curves of plane fields

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We will define the Darboux curves of a plane field and extend some results of Vessiot, Santaló and Hardy about Darboux curves on surfaces.

The dynamics of holomorphic germs tangent to the identity near a smooth curve of fixed points.

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Let $f \in End(\mathbb{C}^2, O)$ be tangent to the identity and with a order $v(f) \geq 2$. We try to study the dynamics of f near the set of his fixed points. Using some results of Abate[2], we prove that if the set of fixed points of f is smooth at the origin, f is tangential to this set, and the origin is not singular, then there are no parabolic curves for f at the origin. After that and using some techniques and results of Hakim [7, 8], we prove that if the set of fixed points of f is smooth at the origin and this last one is a singular point of f, with the pure order of f $v(f) = 1$, then there exist $v(f) - 1$ parabolic curves for f at the origin. Finally and using always the same results of Hakim [7, 8], we prove that If O is dicritical, then there exist infinitely many parabolic curves.

Singularities of Quasi Multi-Germs of Curves

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We classify stably simple irreducible and reducible curve singularities in real spaces of any dimension with respect to the quasi equivalence relation.

Linhas de curvatura perto dos umbílicos segundo análise de A. Gullstrand

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O objetivo deste trabalho foi revisar o artigo Zur Kenntniss der Kreispunkte, publicado em 1904 na Acta Mathematica 29 por Allvar Gullstrand. Neste artigo, Gullstrand estuda a configuração das linhas de curvatura em torno de pontos umbílicos utilizando a carta de Monge até quarta ordem. Para obter tais configurações, o autor ataca o problema considerando as derivadas dos raios de curvatura normal e relaciona o comportamento das linhas de curvatura próximas a um ponto umbílico isolado com curvas especiais contidas no conjunto focal da superfície. As configurações estáveis perto dos umbílicos, denominados Darbouxianos, foram estabelecidas por Gutierrez-Sotomayor de superfícies de classe $\mathcal{C}^4$.

Topological complexity of the configuration space of complex projective space

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In this work, we study the problem from topological robotics of simultaneous rotation of $k-$lines in $\mathbb{C}^{n+1}$, which are fixed by a revolving joint at a base point. In particular, one wants to bring the $k-$lines from its initial position A to a terminal position B by a continuous motion, without collisions. An important problem in motion planning of topological robotics

is to find a general algorithm (*a motion planning algorithm*) once the initial position A and the terminal position B are specified.

Continuity of a motion planning algorithms is desired. It means that the suggested routes (A, B) of going from A to B depends continuously on the states A and B. In general, motion planning algorithms have discontinuities. In order to study the discontinuities in these algorithms the notion of *Topological complexity*, $TC(-)$, was introduced by M. Farber in 2003.

In general, the computation of topological complexity is a very hard task. The main goal in this work is to give new results and study some properties of the invariant $TC(X)$ for some ordered configuration spaces of complex projective spaces.

This work is a part of my PhD's thesis under the supervision of professor Denise de Mattos and it is supported by FAPESP 2016/18714-8.

The Multiplicity of the polar variety $\Gamma_d(F^*(JM(S_{n-2})))$

Terence Gaffney and Michelle Molino

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This work is an extension of the results of Gaffney and Rangachev about the multiplicity of the polar varieties on the paper: Pair of modules and Determinantal Isolated Singularities. The objects in question in this work are the symmetric determinantal varieties; and the author will show how to calculate the multiplicity of the polar variety $\Gamma_d(F^*(JM(S_{n-2})))$ by calculating the degree of the mixed polars $\Gamma_{i,j}(N())$. The work is divided in three parts: The curve case, the surface case and, finally, the general case.

Resolution of irreducible quasi ordinary surfaces

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The aim of this work is to describe the resolution of irreducible quasi ordinary surfaces (algebroids), by Lipman's approach. To achieve our goal, we de

ne to the quasi ordinary surfaces (algebroids) and describe their parametrization by quasi ordinary branches, we also de

ne the quasi ordinary rings, local rings of the quasi ordinary irreducible surfaces, and we study the relationship that exists between the tangent cone and singular locus of a quasi ordinary ring (invariants that appear in these resolutions) and the distinguished pairs of a quasi ordinary normalized branch that represents this ring. Also, we de

ne the special transforms of a quasi ordinary ring and show that they are again quasi ordinary. We conclude with an example of these resolutions.

Singularities of n-vector fields and collections of n-one forms

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A n-vector field defined on a manifold M is a map $V : M \to TM^n$ which associates to each point $x \in M$, n vectors $V_1(x), \ldots, V_n(x)$ in the tangent space T_xM, i. e., $V(x) = (x, V_1(x), \ldots, V_n(x))$.

Inspired by the properties of an n-vector field of gradients $(\nabla f_1, \ldots, \nabla f_n)$ of a Morin map $f : M \to \mathbb{R}^n$, with $\dim M \geq n$, we introduce the notion of Morin singularities in the context of n-vector fields and collections of n-one forms. We also generalize a result of T. Fukuda [**?**, Theorem 1], which establishes a modulo 2 congruence between the Euler characteristic of a compact manifold M and the Euler characteristics of the singular sets of a Morin map defined on M, to the case of Morin n-one forms and Morin n-vector fields.

On tangency of an equisingular family of generically reduced curves

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We consider the following question: if $\pi : (X, 0) \to (\mathbb{C}, 0)$ is a topological trivial flat family of generically reduced curves in $(\mathbb{C}^n \times \mathbb{C}, 0)$ with fibers $X_t := \pi^{-1}(t)$, under what conditions the Zariski tangent cones $C_3(X_0, 0)$ and $C_3(X_t, 0)$ are homeomorphic? We give an answer to this question by introducing an invariant related to the presence of common tangents of the irreducible components of a curve. As a consequence of our result, we give another proof of the following known theorem: if X is a Bi-Lipschitz equisingular family of reduced curves, then the number of tangents of X_t is constant. We also provide an example showing that if X is Whitney equisingular, then in general the number of tangent of X_t can be not constant, even when $(X, 0)$ is Cohen-Macaulay. (Joint work with J. SNOUSSI and A. GILES FLORES)

Germs of holomorphic Foliations of codimension one at $(\mathbb{C}^3, 0)$ non-dicritical of Second Type via indices

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A germ of holomorphic foliations at $(\mathbb{C}^2, 0)$ is said to be a generalized curve if there are no saddle-nodes in its reduction of singularities. We want to present in this poster the study of the object defined above via indices, for a germ of holomorphic foliation of codimension one at $(\mathbb{C}^3, 0)$, of the second type and non-dicritical.

Good real deformations of co-rank one map germs from $\mathbb{R}^3$ to $\mathbb{R}^3$

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We study the good real deformations of co-rank one map germs from $\mathbb{R}^3$ to $\mathbb{R}^3$. First we describe all simple co-rank one map germs that have such a real good deformation and then we study the simplest non simple co-rank one map germ in these dimensions and we show that it does not have a real good deformation. To obtain these results we give a full description of the topology of the discriminant of all real stable deformations of the germ.

Joint work with: Aldicio J. Miranda and Marcelo J. Saia

Structural Stability and Genericity of Principal Configuration on Surfaces Inmersas in $\mathbb{R}^{2,1}$

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The goal is to provide the necessary conditions for a inmersion to be structurally stable in its principal configuration in the Minkowski space 3-dimensional. In addition, for strictly convex inmersion it is to proved that the set of structurally stable inmersion is generic.

Singularities of the Gauss map of hypersurfaces in $\mathbb{R}^4$

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The study of the contact of a submanifold of the Euclidean space with hyperplanes can provide rich and useful information on its extrinsic geometry and it can lead to fascinating results on that geometry, on a local or global level (for example, see [2] and [3]). The contact of an immersed 3-manifold M in $\mathbb{R}^4$ with hyperplanes can be described by the singularities of the height functions on M (the generic behavior of height functions on M was treated with detail on [4]). We can relate height functions on M and its Gauss map via notions of catastrophe theory.

Following the ideas of T. Banchoff, T. Gaffney and C. McCrory on the book Cusps of Gauss mappings [1], we provide in this work different geometrical characterizations for the singularities that may appear in the Gauss map of a generically immersed 3-manifold M in $\mathbb{R}^4$.

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