1. Continuum Theory

Wlodzimierz J. Charatonik and Matt Insall *University of Missouri-Rolla* Metrics on hyperspaces - intuition and theory

abstract We will argue that widely used in topology Hausdorff distance is a rough tool in practical applications (image processing, robotics, terrain analysis). Then, we will construct metrics, and we will argue that they possess some desirable properties. This approach leads to reach theory of discrepancy functions on hyperspaces, as well as possible practical applications.

Jorge M. Martínez Montejano *Instituto de Matemáticas, UNAM* C(X)-coselection spaces and Z-sets in hyperspaces

abstract Answers are provided to questions of Macías and Nadler about when the space of singletons is a Z-set in the hyperspace C(X). In answering one of these questions it is shown in general that C(X) being contractible is sufficient, but not necessary, for X to be a C(X)-coselection space.

Sergio Macías *Instituto de Matemáticas, UNAM* A characterization of homogeneous continua for which the set function T is continuous

abstract In his study of homogenoeus continua, Professor Jones defined what is called now the set function T as follows: Given a continuum X, we define T: P(X)->P(X) by T(A)=x in X | for any subcontinuum W of X with x in Int(W), W and A meet. If we restrcit T to the hyperspace of compact subests of X, 2^X, we may ask when T is continuous. We characterize homogeneous continua for which T is continuous.

Marcus Marsh *California State University, Sacramento* A Generalization of Brouwer's Fixed Point Theorem

abstract We generalize Brouwer's Fixed Point Theorem for n-balls B to a larger class of mappings whose images may not be a subset of B. Behavior of the mappings on the boundary of B, which also need not be mapped into B, is sufficient to determine the existence of fixed points. In the process, we generalize theorems of S. Eilenberg and E. Otto, of K. Morita, and of W. Holsztynski related to dimension and universal mappings.

Jesús F. Tenorio-Arvide *Benemŕita Universidad Autónoma de Puebla* Disk-like Products

abstract We prove that continua X and Y are atriodic and tree-like when the product XxY is disk-like.

Florencio Corona Vázquez *Benemérita Universidad Autónoma de Puebla* Compactifications of $[0, \infty)$ whose Cone have the Fixed Point Property

abstract We sketch the proof of the following result:

Theorem: Let X be a compactification of half-ray $S = [0, \infty)$ with remainder Y, where Y is a locally connected continuum such that $Cono(Y)$ has the fixed point property. If for each $\varepsilon > 0$ there exists a map $f_\varepsilon : S \to S$ such that f_ε is within ε of identity map on S and $f_\varepsilon(S)$ is contained in an arc, then $Cono(X)$ has the fixed point property.

Alejandro Illanes *IMATE-UNAM and CSUS* Counterexamples on hyperspaces *abstract* Let X be a metric continuum (compact connected metric space). Let C(X)denote the hyperspace of subcontinua of X with the Hausdorff metric. It is known that, in general, C(X) has "nicer" properties than the space X. For example, C(X) is always arcwise connected even if X does not contain any arc. This situation has originated a lot of questions in the line of "how really nice are hyperspaces". In this talk we disscus some counterexamples that have solved some of these questions in the negative.

Gerardo Acosta *IMUNAM* Dinamics on Dendrites

abstract In this talk we study the dynamical behaviour of a homeomorphism f from a dendrite X onto itself. Given a point p of X we will show that either the omega limit set of p is a periodic orbit or a Cantor set. Recall that the omega limit set of p is the set consisting of all points which are limit of a subsequence of points in the orbit of p.

Carlos Islas *Facultad de Ciencias, UNAM* Ejemplos de continuos 2-equivalentes

abstract Un continuo es llamado 2-equivalente si slo contiene 2 tipos de subcontinuos no degenerados no homeomorfos. Slo existen caracterizaciones parciales de este tipo de continuos, adems se han dado familias de continuos que cumplen propiedades especficas. Usando lmites inversos se construyen algunos que cumplen o no la propiedad de Kelley.

Fernando Macas Romero *Facultad de Ciencias Físico Matemáticas (FCFM) de la Benemérita Universidad Autónoma de Puebla (BUAP)* A subset of the hyperspace of a continuum

abstract Let X be a continuum metric and $C(X)$ be the hyperspace of subcontinuum of X whit the Hausdorff metric. Let $L(X)$ be the space of subsets of X such that there exists a neighborhood U of A in $C(X)$ and a homeomorphisms f of U in $[0,1]\times[0,1]$ with the property $f(A)=(0,0)$. In this talk we give examples of the closure of $L(X)$ for certain continua X. Particularly, we see the case when the closure of $L(X)$ is homeomorphic to X and their consequences.

David Herrera-Carrasco *Universidad Nacional Autnoma de Mxico* HYPERSPACES OF DENDRITES

abstract A continuum one is a nonempty, nondegenerate, compact, connected metric space. We consider the following hyperspace of a continuum X, $2^X = \{A \subset X : A \text{ is nonempty and closed}\}$; $C(X) = \{A \in 2^X : A \text{ is connected}\}$. And for $n \geq 1$, $F_n(X) = \{A \in 2^X : A \text{ has at most } n \text{ points}\}$; $C_n(X) = \{A \in 2^X : A \text{ has at most } n \text{ components}\}$. All the hyperspaces are endowed with the Hausdorff metric H. A dendrite means a locally connected continuum containing no simple closed curve. We denote by D to the family of dendrite X, whose set of end points is closed and X is not an arc.

The author has shown:

Theorem 1. Let X in D and let Y be a continuum. If $C(X)$ is homeomorphic to $C(Y)$. then X is homeomorphic to Y; And the converse: Theorem 2. Let X a dendrite and X is not in D, then there exist continuum L such that X is not homeomorphic to L and $C(X)$ is homeomorphic to $C(L)$; Theorem 3. Let X and Y in D and $n \geq 3$. If $C_n(X)$ is homeomorphic to $C_n(Y)$, then X is homeomorphic to Y.

The purpose of this talk is to proved the following result:

Theorem. Let X in D, Y a dendrite and $n \geq 3$. If $C_n(X)$ is homeomorphic to $C_n(Y)$, then X is homeomorphic to Y.