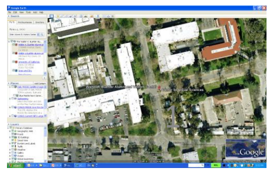
Activities, Time Use and Travel Behavior in Multiple Space-Time Dimensions

Kostas Goulias
Department of Geography and GeoTrans Laboratory,
University of California Santa Barbara
goulias@geog.ucsb.edu



Fun Stuff

- Top 10 things I learned from Ryuichi
  1. Enjoy academic work (low pay, work all the time, have no time to do anything else and so forth)
  2. Collaborate and share ideas in a constructive way
  3. Respect the work of others, acknowledge their contribution and use it in a creative way
  4. Appreciate family life (he hired Liz and put us to work together – a year later he was celebrating at our wedding)
  5. Appreciate the bouquet before consuming large quantities of inspiration inducing liquids

  5 more things I will not tell you about (e.g., deadlines, students, administrators etc)

RK The Master of Ba

- Nishida and Shimizu are credited as the philosophers creating the concept of Ba. Later Nonaka in knowledge creation refined the concept further.

- Ba is a context endowed with meaning and it is a shared space that serves as a foundation for knowledge creation.

- It is also *shared space* for *emerging relationships*.
- This space can be:
  - physical (e.g., office, dispersed business space),
  - virtual (e.g., email, teleconference),
  - mental (e.g., shared experiences, ideas, ideals)
  - any combination of all three above.

- Ba provides a platform for advancing individual and collective knowledge.

- Ryuichi was a master of creating and enabling Ba and understood that Ba is everywhere and anytime
  - His office, the Old Library in Oxford, the Dutch bar, the piano bar at the Omni Shoreham in DC, the Barn, and so forth

Principles of Behavioral Dynamics

- The household and its members in their surrounding environment are in a continuous process of adjustment
- Examples:
  - Life cycle and turning points in life
  - Day to day scheduling of activities
  - Time allocation among household members and others in the social network
  - Activity opportunities and travel time

Source: combination of Oxford 1988 conference, Kitamura 2000 Handbook of Transport Modeling (Eds Hensher&Button)

Principles of Behavioral Dynamics

- Processes of Adjustment with Lags and leads
  - Information awareness and use = short and long lags depending on context
  - Searching for alternatives = length of search is function of behavioral style (optimizing vs satisficing)
  - Experimentation = effort to settle and transaction costs
  - Capability constraints = purchasing budget
  - Institutional constraints = external and internal to household obligations

Principles of Behavioral Dynamics

- Heterogeneity*
  - Differences of lifestyles & roles (observed, unobserved, and unobservable)
  - Differences in types of relationships (observed, unobserved, and unobservable)
  - Differences in sensitivity to changes in the environment surrounding the household (observed, unobserved, and unobservable)

*Note the unobserved heterogeneity effects on illusions of state dependence/habit

Decision Making in Context

- Inertia and "stickiness" of habits = after searching and experimentation households avoid transaction costs
- Thresholds = decisions to change behavioral pattern based on a cost-benefit analysis of breaking habits
- Satisficing = habitual behavior may be at a lower point than optimum
- Properties:
  - Partial (gradual) adjustments possibly observed during search and experimentation
  - Speed of adjustment depends on the decision and context
  - Path dependency in adjustments that depends on knowledge
  - Asymmetry and hysteresis of change (path to increase different than path to decrease)

(Longitudinal)Data to test Hypotheses

- Panel Surveys*
  - Life cycle changes
  - Long vs short term decisions
  - Leads and lags
- Before After Experiments
  - Impose a change
  - Ask questions tailored to decision and context
- Direct tracking
  - GPS family
  - Combinations with panels and experiments

*Note the long research record on panel survey design and countering of panel-specific issues (non-response, attrition, fatigue, conditioning, incomplete change observed)

Analytical Tools

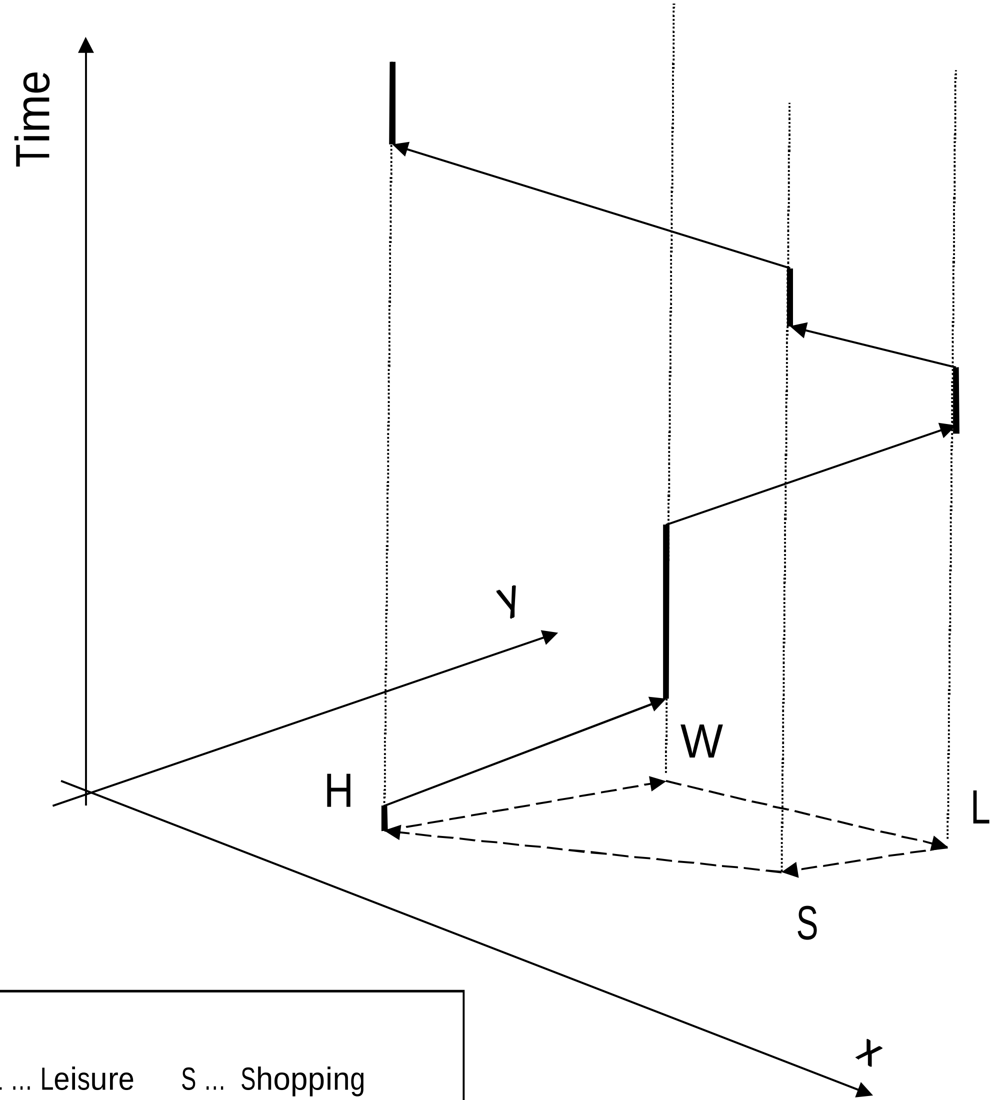
- Stochastic Processes
  - Renewal processes
  - Markov renewal processes
  - Markov processes
  - Markov chains
- Discrete time regression models
  - Linear
  - Distributed lags
  - Lagged dependent variables
  - Non-linear models
  - Dynamic models

Note: Structural equations models and computational process models could also be included here – not in RKs review but used by his group and collaborations

Principles of Behavioral Dynamics in Space and Time

- Hagerstrand (circa 1970) - concept of a space-time path to illustrate how a person navigates his or her way through the spatial-temporal environment time geography
- Hagerstrand - concept of constraints
  - Human spatial activity is not a set of independent decisions by spatially or temporally autonomous individuals.
  - Categories of limitations =
    - Capability constraints refer to the limitations on human movement due to physical or biological factors.
    - Coupling constraint refers to the need to be in one particular place for a given length of time, often in interaction with other people.
    - Authority constraint is an area (or "domain") that is controlled by certain people or institutions that set limits on its access to particular individuals or groups.

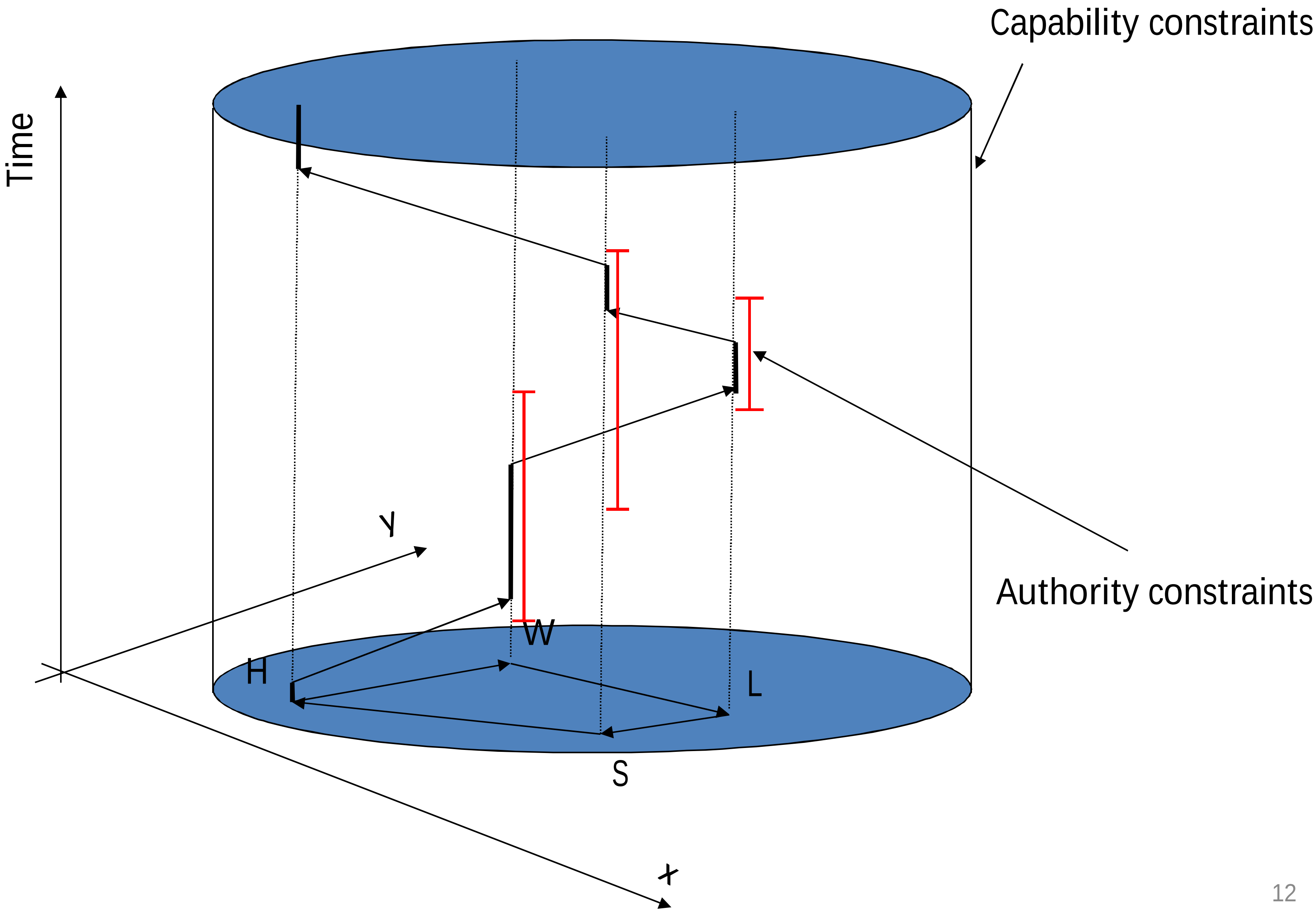
Activities in Time and Space



Ondrej Pribyl
Visualization

Activities:
H ... Home W ... Work L ... Leisure S ... Shopping

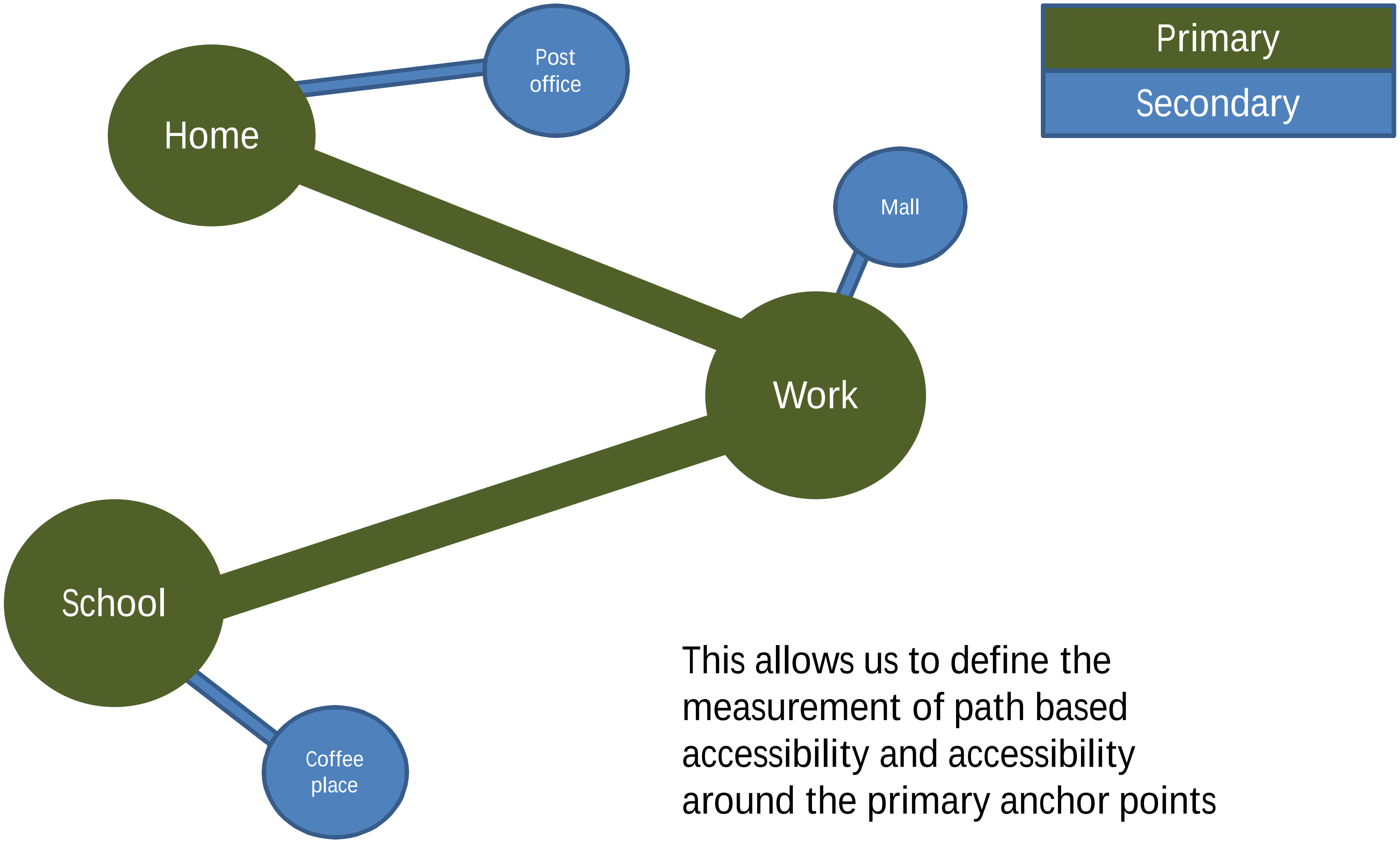
Effect of constraints in spatio-temporal domain



Principles of Behavioral Dynamics in Space and Time

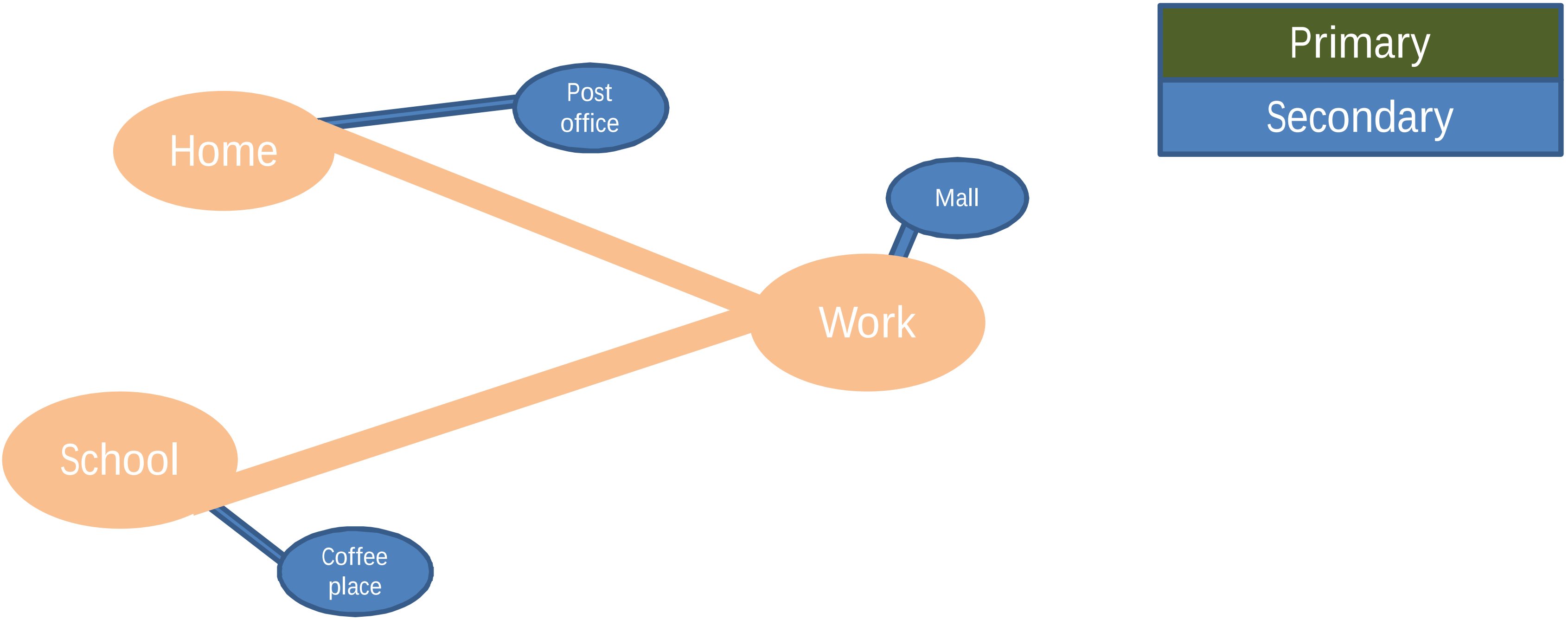
- Golledge (circa 1970)- The *anchor point theory* = key structural element of a cognitive map (mental representation of the world surrounding us)
  - Anchor Point Hypothesis: places at local level organized around central anchor points
  - Anchor points form basis for spatial organization at higher level
  - Minor places in two local areas are not necessarily directly related in representation
  - Foundation theory of spatial cognition and knowledge representation

Anchor Points (measured)



This allows us to define the measurement of path based accessibility and accessibility around the primary anchor points

Anchor Points (perceived)



This allows us to define the measurement of path based accessibility and accessibility around the primary anchor points

Ryuichi Kitamura in 1980s merged these ideas with dynamic travel behavior

THE SYNTHETIC ABILITY

The patterns of urban travel are influenced by the interactions between four fundamental elements. Two of the elements are related to the individual traveler: time budget and activity pattern. The other two elements are related to the urban system: land use and transportation. These elements interact with each other within a framework of space and time.

THE CLEVER MODEL

Based on a time dependent markov renewal model of trip chaining, it is possible to simulate the many properties of the constrained activity paths in space and time. Through the stochastic processes in the model, the interrelationships between travel movements and urban structures can be simulated and examined.

- Kitamura (1983) and a series of trip chaining papers

Trip Chains and Destination Choice

choice analysis. Choice of a destination location may be influenced not only by the attributes of, and accessibility to, an opportunity by itself but also by the attributes of, and accessibilities to, other opportunities that may be reached from that opportunity.

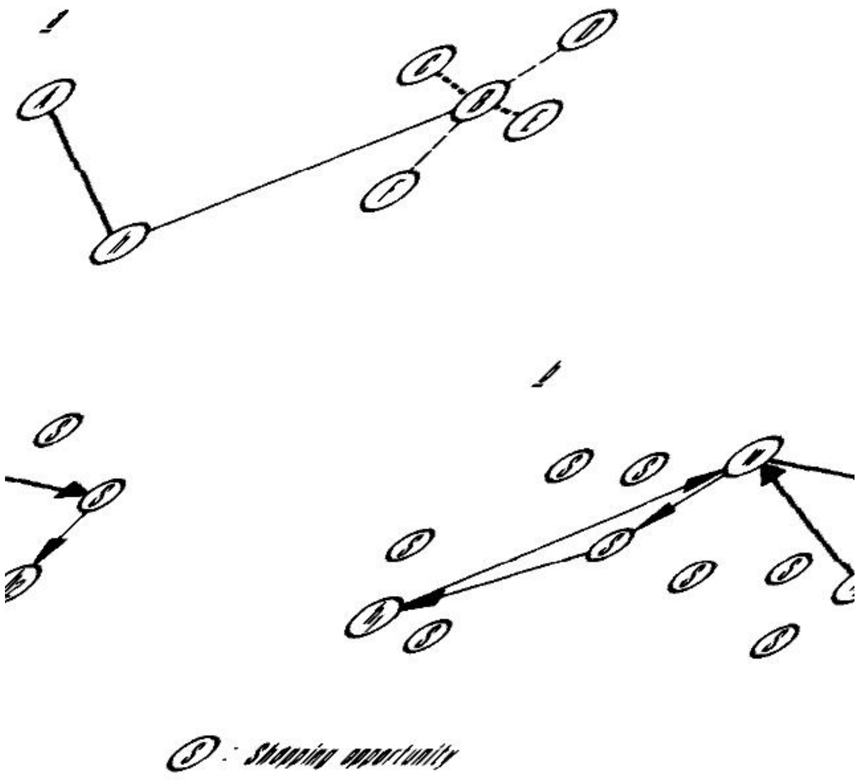


Fig. 1. Interdependencies of destination choices in trip chains.

Incorporating trip chaining into the analysis of destination choice (Trans Res, 1983)

Elements in Models 20 Years Later

- Daily Patterns (entire skeletons or primary tours)
- Activity Frequency Analysis (episodes)
- Activity Duration and Time Allocation
- Departure Time Decision
- Trip Chaining and Stop Pattern Formation
- Stops and Destinations

- All these models used together produce a synthetic schedule

Some Examples

Model Review

- Completed a review of approx. 60 “activity-based” transportation models
- Paradigms implemented (alone or in combination):
  - Cellular Automata (TRANSIMS)
  - Constraint-based (AMOS, BSP, CARLA, FAMOS, FEATHERS)
  - Computational Process Model (ALBATROSS, SCHEDULER, TASHA)
  - Data-statistical Distributions (DEMOS, MORPC, ORIENT, TASHA)
  - Econometric Utility-based (CEMDAP, PCATS, STARCHILD, TASHA)
  - Framework (SCHEDULER, SMART)
  - Hazards Risk (COMRADE)
  - Microsimulation (ALBATROSS, CEMDAP, FAMOS, TRANSIMS)
  - Operations Research (HAPP)
  - Psychometric Cognitive (SCHEDULER, GISICAS)

Activity Model Behavioral Units

Decision Makers	Groups Modeled					
	Unknown/ Unspecificed	Workers	College Students	Adults	Partial Households	Entire Households
Unknown/ Unspecified	BSP				PESASP (16 yrs +)	
Individuals	Daily Activity Schedule, Hayes-Roth & Hayes-Roth, PCATS, SMART, Vause	Alam-PSEM, AMOS, CATGW, COBRA	Alam-PSEM, COMRADE	AURORA, DATS/LATP, FEATHERS, MASTIC, PATRICIA, SIMAP, Synthetic Daily Activity-Travel Patterns	Portland Daily Activity Schedule (16 yrs +), Wen and Koppelman (married couples)	CARLA, CentreSIM – regional, Ettema et al's (HCG), GISICAS, HAPP, MORPC, New York "Best Practice", PETRA, RAMBLAS, San Francisco, SCHEDULER, SMASH, STARCHILD, TRANSIMS
Households				ALBATROSS		Adler and Ben-Akiva, CEMDAP, CentreSIM–Medoid, DEMOS, FAMOS, ILUTE, MERLIN, MIDAS, PUMA, TASHA
Specified Groups						ILUTE
Workers		Kawakami and Isobe				
Homogenous Population Groups	ORIENT				VISEM (10 yrs +)	

Model Temporal and Spatial Resolutions

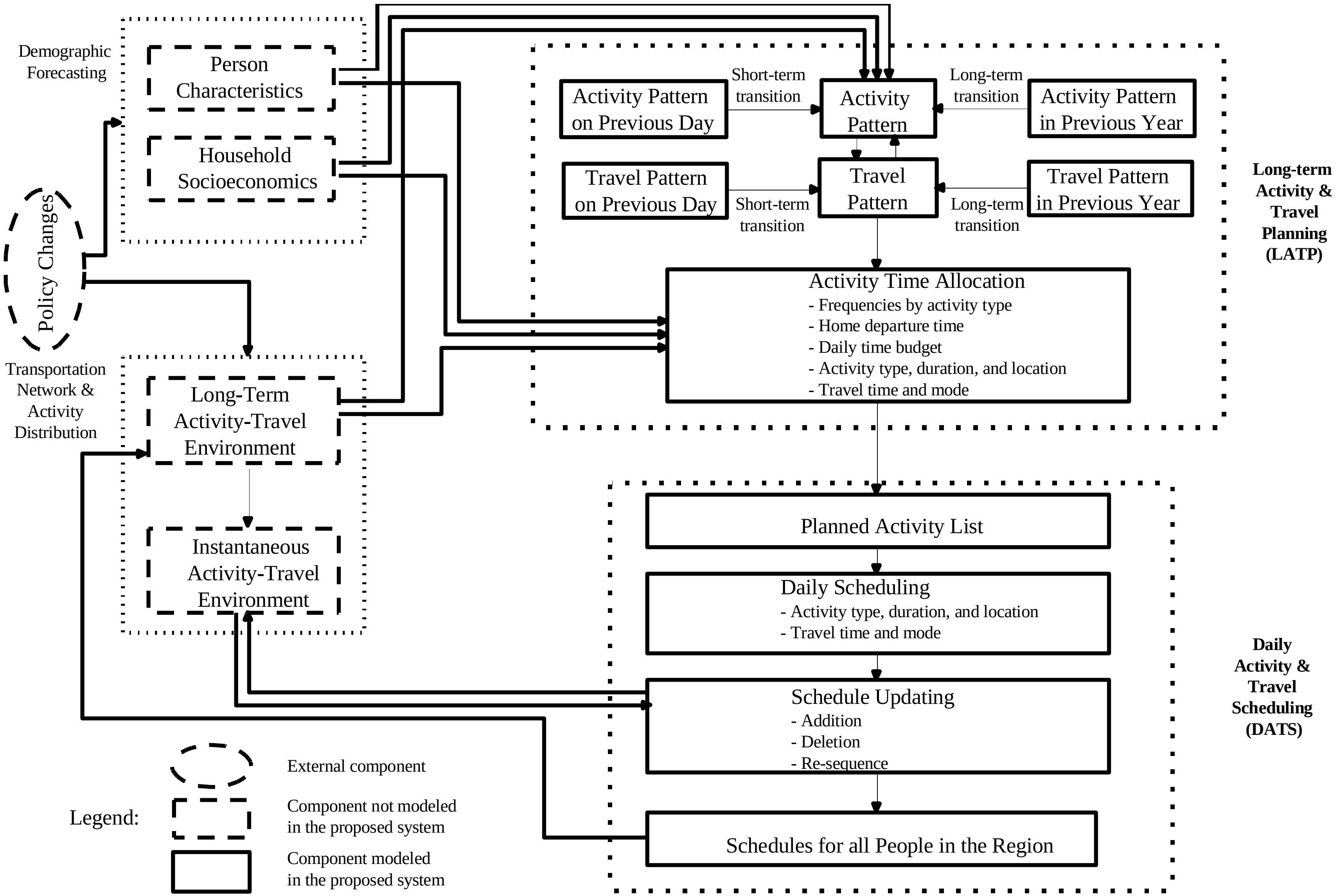
Spatial Resolution	Temporal Resolution							
	Unknown/ Unspecificed	None	Year	Blocks of Time	Hour	5 to 15 Minutes	Minute	Second or Continuous
Unknown/ Unspecified	BSP, Ettema (HCG), Hayes-Roth, Kawakami and Isobe, ORIENT, Wen and Koppelman					Starchild		
None	Vause, CATGW	Adler and Ben-Akiva, Daily Act. Sch., PESASP, SCHEDULER, SMART	MIDAS, DEMOS	CARLA, COBRA, Synthetic Daily Activity-Travel Patterns		HAPP	CentreSIM - medoid	COMRADE, DATS/LATP
Region			MERLIN					
Zones	AMOS	PATRICIA		NYMTC, PCATS, PETRA, Portland, SFCTA	VISEM, CentreSIM - regional	TASHA	MASTIC, RAMBLAS	FAMOS
Sub-zones					MORPC			ALBATROSS, AURORA. FEATHERS
Points		SMASH			Alam PSEM	SIMAP	GISICAS	CEMDAP, ILUTE, PUMA, TRANSIMS

June Ma, Ph.D. (PennState 1997)

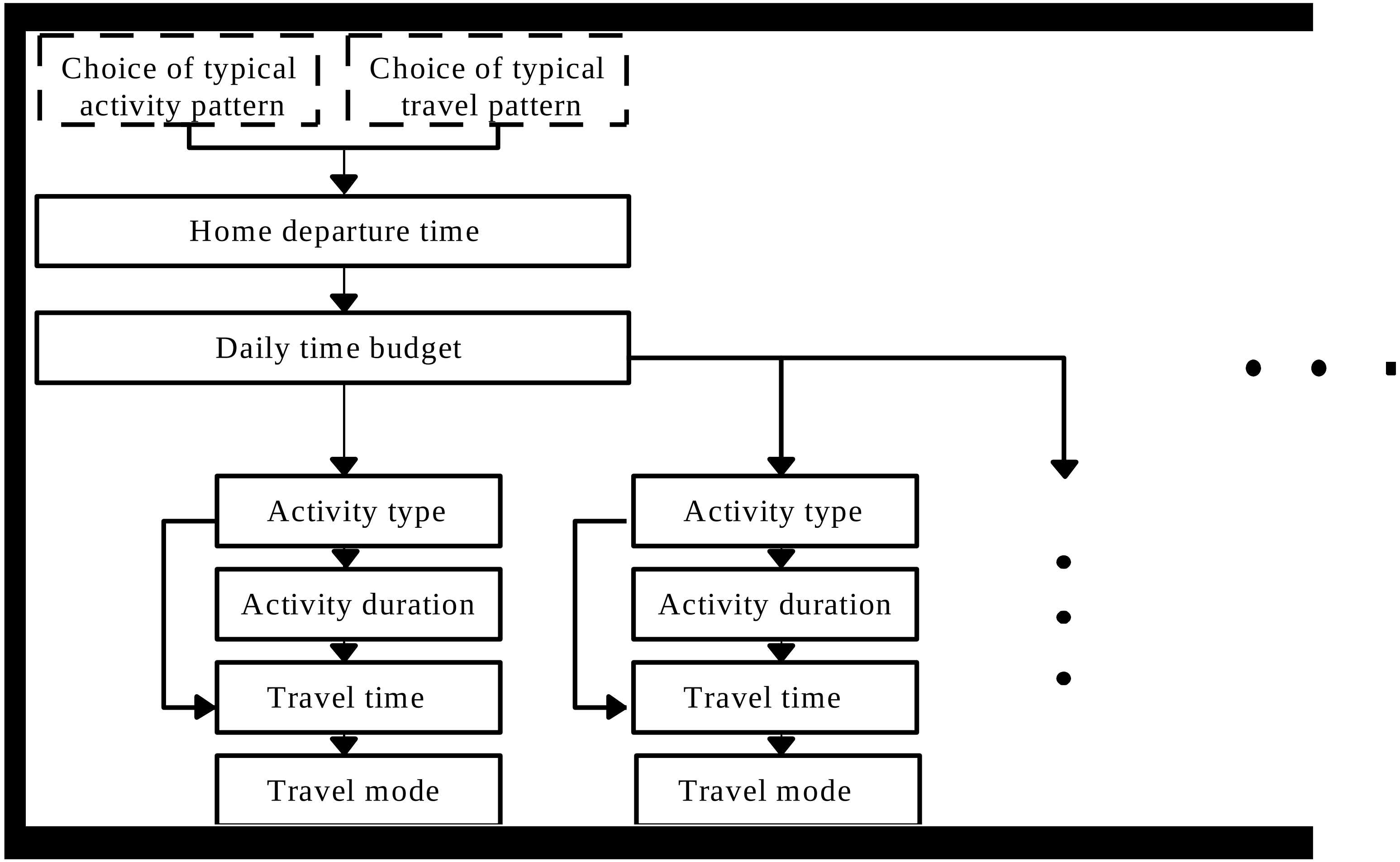
Uses a panel survey and a two day travel diary

Incorporates the behavioral dynamics elements Ryuichi talked about 15 years earlier

The June Ma Model



Decision Sequences



Simulated Mean Values with Different Daily Time Budget

	Observed	**Predicted**		**Simulated**
			Baseline	*Random Budget*
Home departure time	537.6	522.6	554.0	555.2
Daily time budget	525.0	548.3	536.8	560.4
Simulated total time*			475.7	499.7
Total dur. of sub. act.	258.5	227.0	109.6	92.3
Total dur. of main. act.	46.8	48.0	84.5	63.9
Total dur. of out-of-home act.	39.3	45.9	53.5	36.2
Total dur. of in-home act.	56.1	53.9	25.2	20.4
Total travel time	77.5	64.0	39.3	53.9
Freq. of sub. act.	0.92	0.88	1.02	0.91
Freq. of main. act.	1.49	1.60	2.36	1.95
Freq. of out-of-home lei. act.	0.45	0.52	0.67	0.56
Freq. of trip chains	1.43	1.50	0.93	0.85
% other	3.56	4.21	5.02	4.97
% car	57.69	57.86	54.34	55.57
% carpool/vanpool	34.94	34.34	37.54	36.41
% non-motorized	3.81	3.59	3.08	3.07

* Simulated total time is the sum of all activity durations and travel times. It is equivalent to time budget observed in the simulation.
** Time and durations are measured in minutes and frequencies in episodes.

Penn State Evacuation Model

- Sajjad Alam, MS, 1996
  (simplified model of the PennState campus life – 40K students in a 120K area – urban island in a forest)
- Application for general planning, circulation plan, emergency operations, and special events

Used Activity Diary to Derive Time of Day Profiles

Personal needs (includes sleep)

Paid work

Education

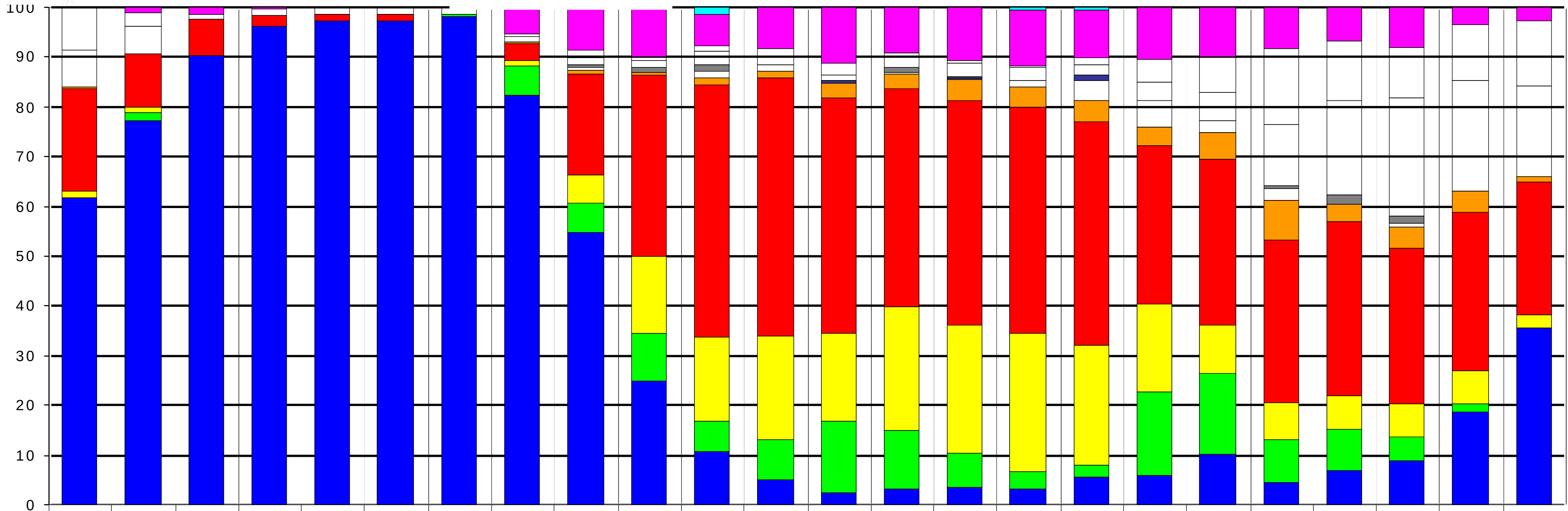
Eat Meal

Travel

A: Personal Needs
B: Eat Meal
C: Paid Work
D: Education
E: Household and family care
F: Shopping
G: Medical
H: Voluntary, Organizational and Community
I: Socializing and Entertainment
J: Sports and Hobby
K: Travel
L: Other

A: Personal Needs
B: Eat Meal
C: Paid Work
D: Education
E: Household and family care
F: Shopping
G: Medical
H: Voluntary, Organizational and Community
I: Socializing and Entertainment
J: Sports and Hobby
K: Travel
L: Other

Activity Participation - Students

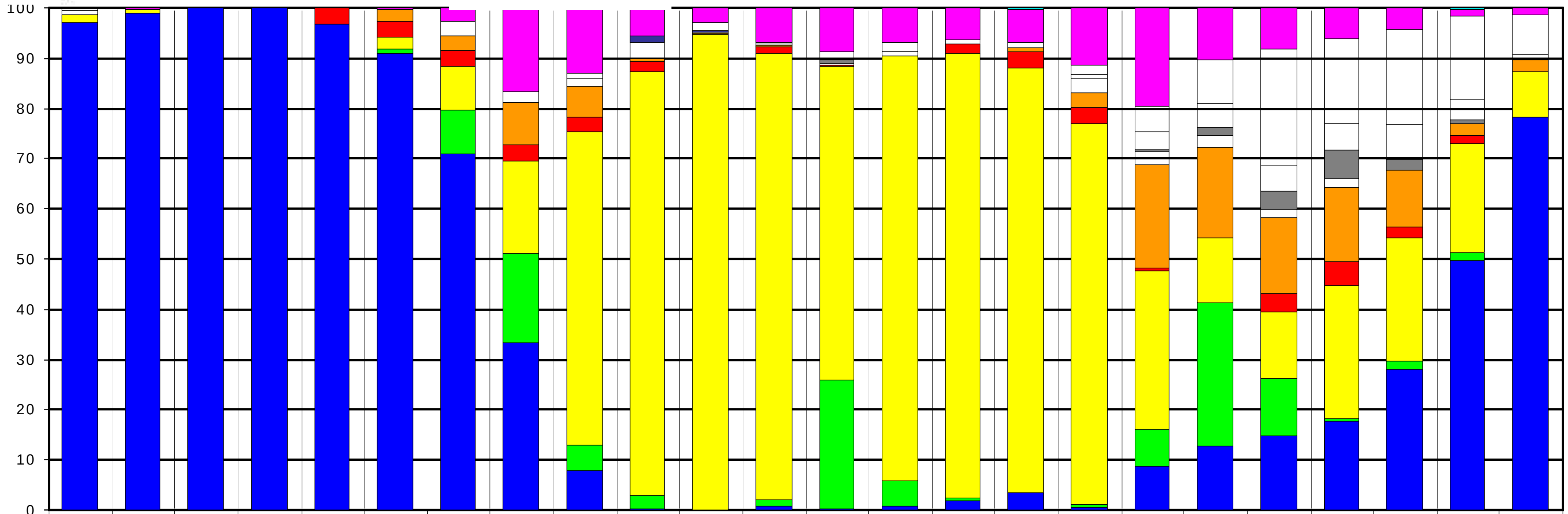


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
K	0.0	1.0	1.2	0.3	0.0	0.0	0.0	5.2	8.4	10.0	6.4	8.3	11.3	9.0	10.7	11.2	9.6	10.4	9.9	8.4	6.8	8.0	3.5	2.8
J	8.4	2.7	0.0	0.0	0.0	0.0	0.0	0.5	1.7	0.6	1.3	1.5	2.2	1.0	0.6	0.1	1.3	4.6	7.3	15.1	12.0	10.3	11.1	12.9
I	7.7	5.6	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.4	2.6	1.8	1.1	2.0	2.6	2.8	2.1	3.6	5.7	12.4	18.9	23.7	22.2	18.2
H	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.2	1.3	0.0	0.0	1.2	0.2	0.0	0.0	0.0	0.0	0.5	1.9	1.3	0.0	0.0
G	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.2	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	1.4	1.3	0.0	0.2	0.2	1.3	4.0	5.4	2.4	2.4	0.0	1.0	0.0	0.0
E	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	0.5	1.3	1.2	3.0	2.9	4.3	4.1	4.2	3.7	5.2	7.9	3.5	4.2	4.3	1.3
D	20.5	10.9	7.1	2.2	1.3	1.3	0.0	3.7	20.2	36.3	51.0	52.1	47.3	44.0	45.1	45.5	45.1	31.8	33.4	32.9	35.2	31.2	31.9	26.6
C	1.3	1.0	0.0	0.0	0.0	0.0	0.0	1.0	5.7	15.6	16.6	20.8	17.5	24.9	25.6	27.7	24.0	17.6	9.7	7.5	6.5	6.8	6.6	2.6
B	0.0	1.6	0.0	0.0	0.0	0.0	0.6	5.8	6.0	9.6	6.2	7.9	14.4	11.6	6.9	3.4	2.5	16.9	16.5	8.3	8.2	4.7	1.7	0.0
A	61.9	77.2	90.4	96.2	97.4	97.4	98.1	82.5	54.7	24.8	10.8	5.1	2.5	3.3	3.5	3.3	5.6	5.9	10.0	4.7	7.1	8.9	18.6	35.7

Time Segment (Hour)

Activity Participation - Faculty

A: Personal Needs
B: Eat Meal
C: Paid Work
D: Education
E: Household and family care
F: Shopping
G: Medical
H: Voluntary, Organizational and Community
I: Socializing and Entertainment
J: Sports and Hobby
K: Travel
L: Other

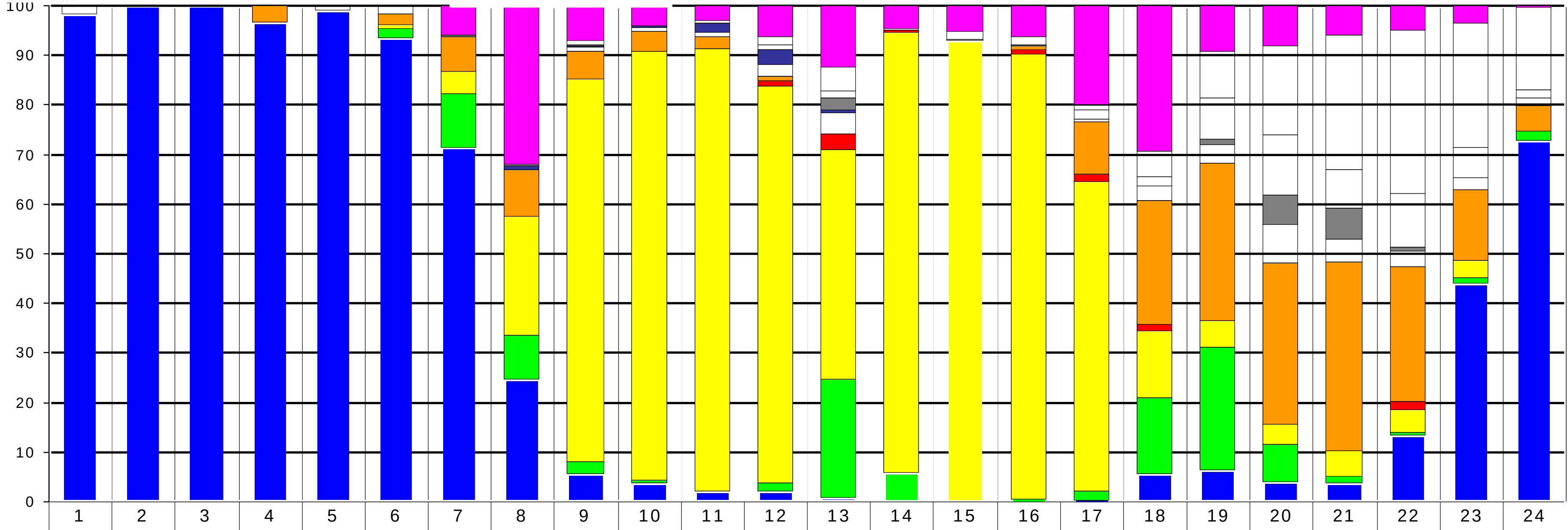


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
K	0.0	0.3	0.0	0.0	0.0	0.3	2.6	16.8	12.9	5.4	2.8	6.8	8.8	6.9	6.4	6.6	11.3	19.7	10.4	8.2	6.1	4.2	1.3	1.4
J	0.7	0.0	0.0	0.0	0.0	0.0	2.9	2.0	1.2	0.0	1.6	0.4	1.6	1.8	0.7	0.0	2.0	4.9	8.6	23.4	16.9	19.1	16.7	7.8
I	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.7	3.4	4.8	4.8	5.2	6.9	3.9	1.2
H	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.5	1.4	3.8	5.7	2.1	0.8	0.0
G	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	3.3	0.3	0.1	0.3	0.0	0.0	0.9	3.0	2.7	2.5	1.6	1.8	0.0	0.0	0.0
E	0.0	0.0	0.0	0.0	0.0	2.3	3.1	8.3	6.0	0.5	0.4	0.4	0.0	0.0	0.0	0.8	3.0	20.8	17.8	15.0	14.8	11.5	2.3	2.3
D	0.0	0.0	0.0	0.0	3.1	3.1	3.1	3.1	3.1	2.1	0.0	1.2	0.1	0.0	2.1	3.1	3.1	0.5	0.0	3.6	4.7	2.0	1.6	0.0
C	1.6	0.8	0.0	0.0	0.0	2.3	8.7	18.5	62.3	84.4	94.7	89.0	62.4	84.9	88.6	84.8	75.9	31.5	13.1	13.4	26.4	24.6	21.8	8.9
B	0.0	0.0	0.0	0.0	0.0	1.0	8.7	17.8	5.1	2.4	0.0	1.2	25.7	4.9	0.5	0.0	0.4	7.4	28.6	11.5	0.4	1.6	1.6	0.0
A	97.0	99.0	100.0	100.0	96.9	90.9	70.8	33.4	7.9	0.4	0.0	0.9	0.4	0.8	1.8	3.4	0.7	8.6	12.6	14.7	17.8	28.1	49.7	78.4

Time Segment (Hour)

A: Personal Needs
B: Eat Meal
C: Paid Work
D: Education
E: Household and family care
F: Shopping
G: Medical
H: Voluntary, Organizational and Community
I: Socializing and Entertainment
J: Sports and Hobby
K: Travel
L: Other

Activity Participation - Staff



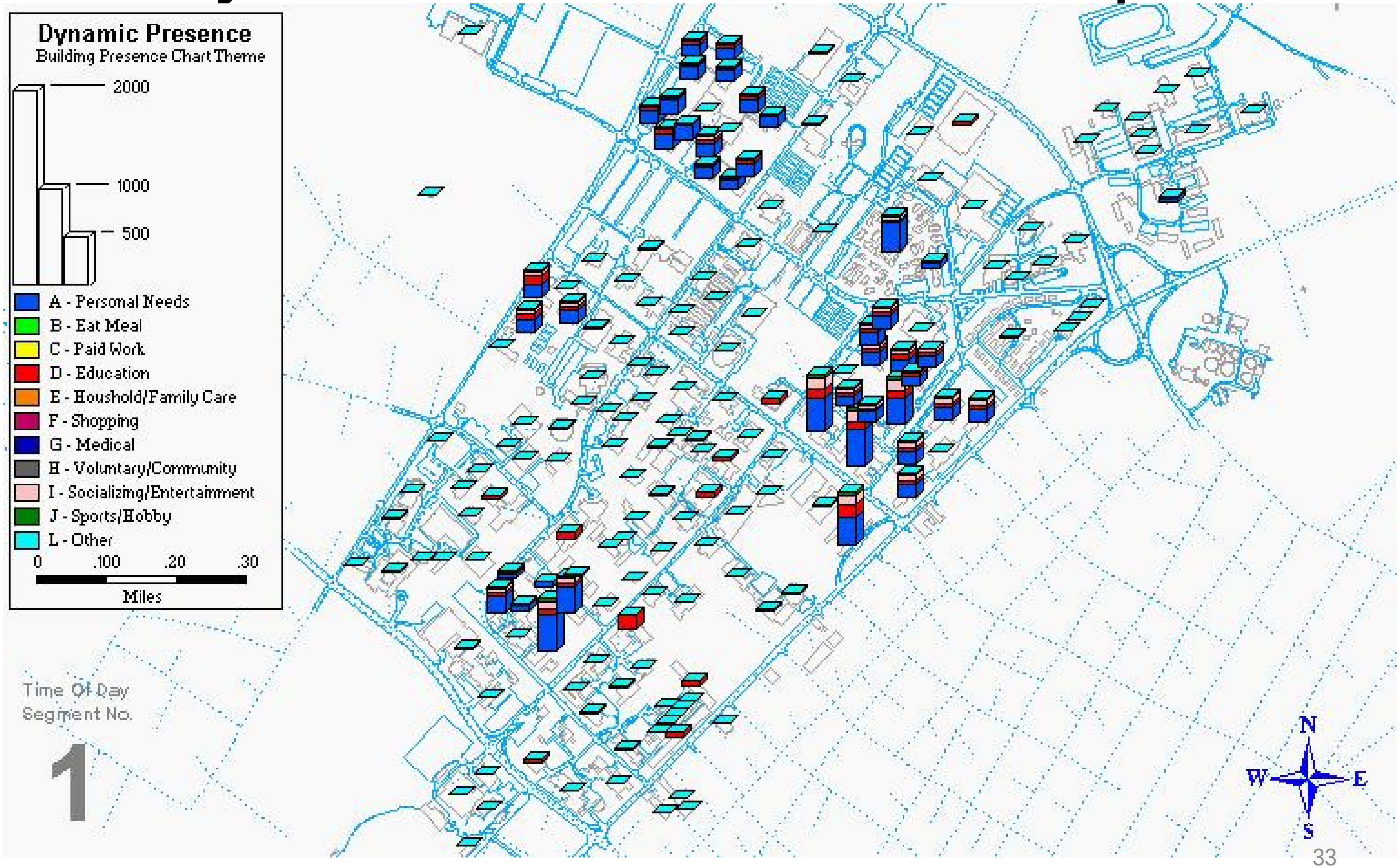
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
K	0.0	0.0	0.0	0.0	0.0	0.0	6.0	31.9	7.0	4.0	2.9	6.3	12.3	4.6	5.1	6.3	20.0	29.2	9.2	8.0	5.9	4.9	3.5	0.1
J	1.6	0.0	0.0	0.0	0.8	1.6	0.0	0.0	0.8	0.0	0.7	1.6	4.9	0.0	0.0	0.0	1.1	5.2	9.4	18.2	27.0	33.0	25.0	16.8
I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	1.0	1.2	0.4	1.6	1.6	1.6	1.8	8.2	11.9	7.8	10.7	6.1	1.6
H	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.0	0.0	0.1	2.6	0.0	0.0	0.3	0.0	0.0	1.2	5.9	6.4	0.8	0.0	0.0
G	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.3	0.3	1.8	2.9	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.0	0.8	2.4	4.4	0.0	0.4	0.0	0.5	3.2	3.7	8.0	4.5	3.3	2.5	1.6
E	0.0	0.0	0.0	3.3	0.0	2.0	7.1	9.4	5.7	4.0	2.3	0.8	0.0	0.0	0.0	0.7	10.7	25.0	31.7	32.5	38.3	27.0	14.2	4.9
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	3.3	0.3	0.0	0.7	1.6	1.2	0.0	0.0	0.0	1.6	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.8	4.5	24.1	76.9	86.6	89.3	79.9	46.2	88.7	92.9	89.9	62.2	13.3	5.3	4.1	4.9	4.6	3.5	0.0
B	0.0	0.0	0.0	0.0	0.0	2.0	10.8	8.6	2.5	0.5	0.1	1.8	23.8	6.0	0.0	0.5	2.0	15.4	24.7	7.5	1.4	0.6	1.2	2.0
A	98.4	100.0	100.0	96.7	99.2	93.4	71.5	24.9	5.7	3.7	2.0	2.0	0.8	0.0	0.0	0.0	0.1	5.7	6.5	4.0	3.8	13.4	44.0	72.8

Time Segment (Hour)

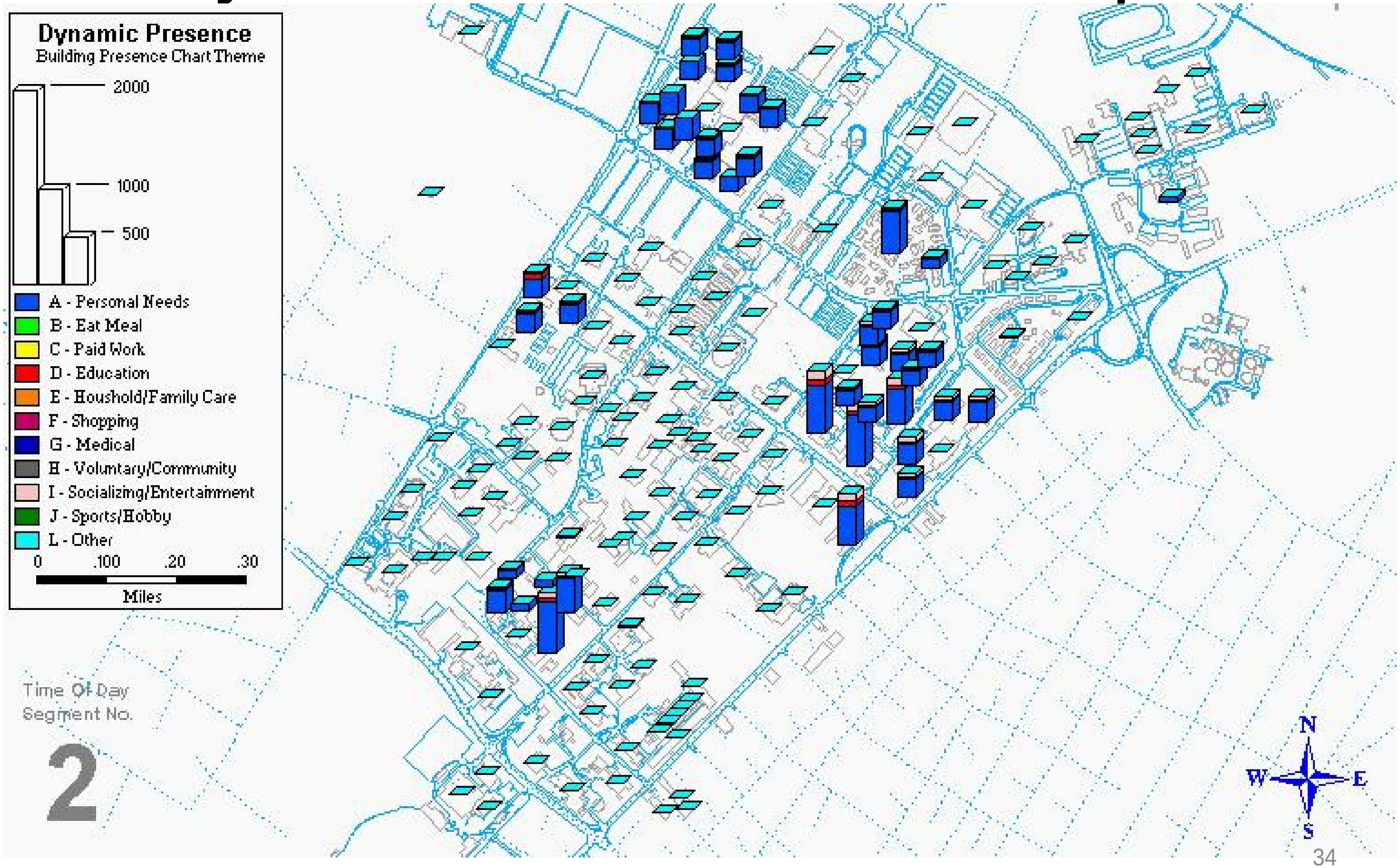
Assembled

- Administrative records
- Building characteristics
- Developed attractiveness indicators (a gravity/distance model)
- A survey of activity participation
- A method to sequence activity participation

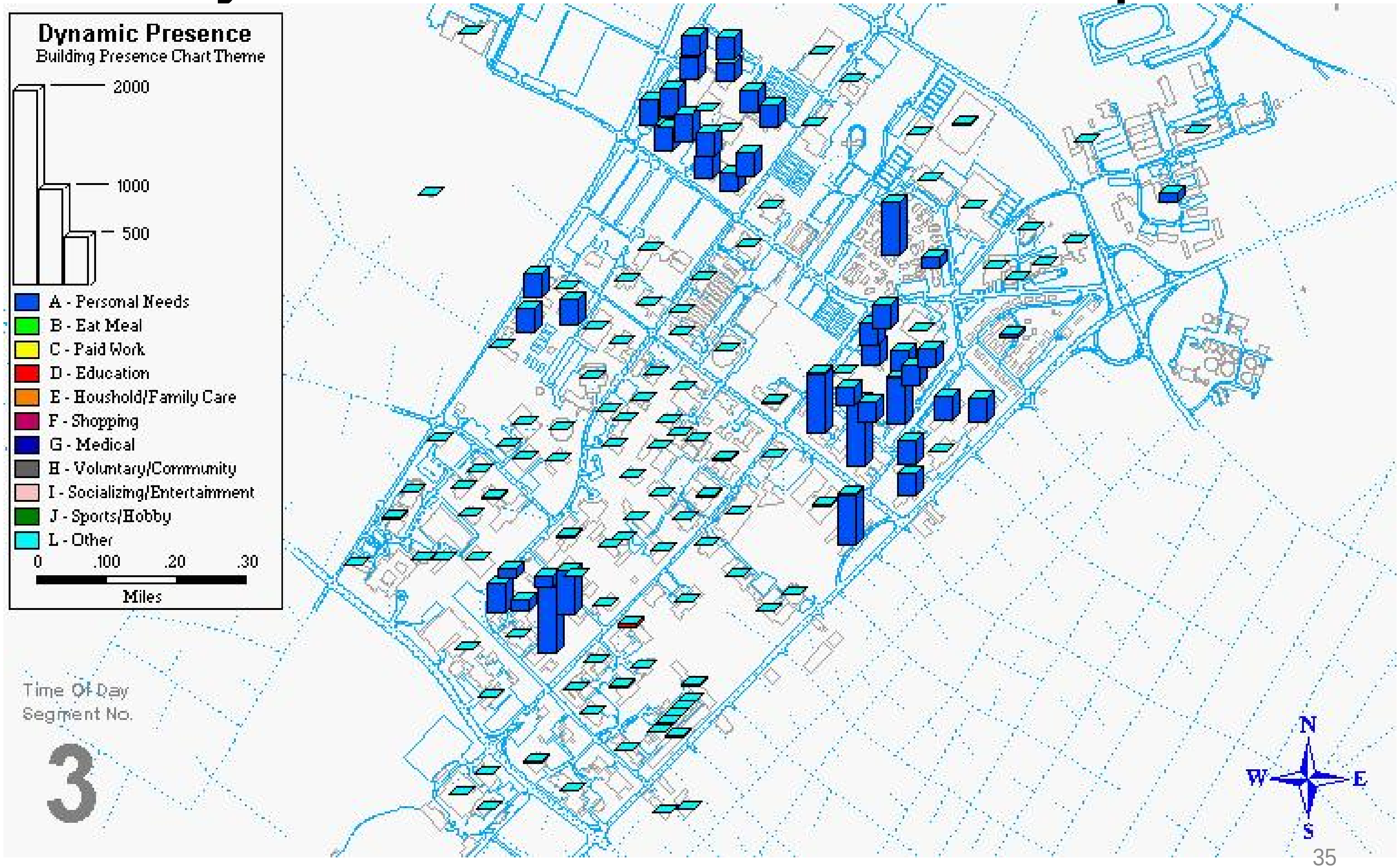
Dynamic Presence on Campus



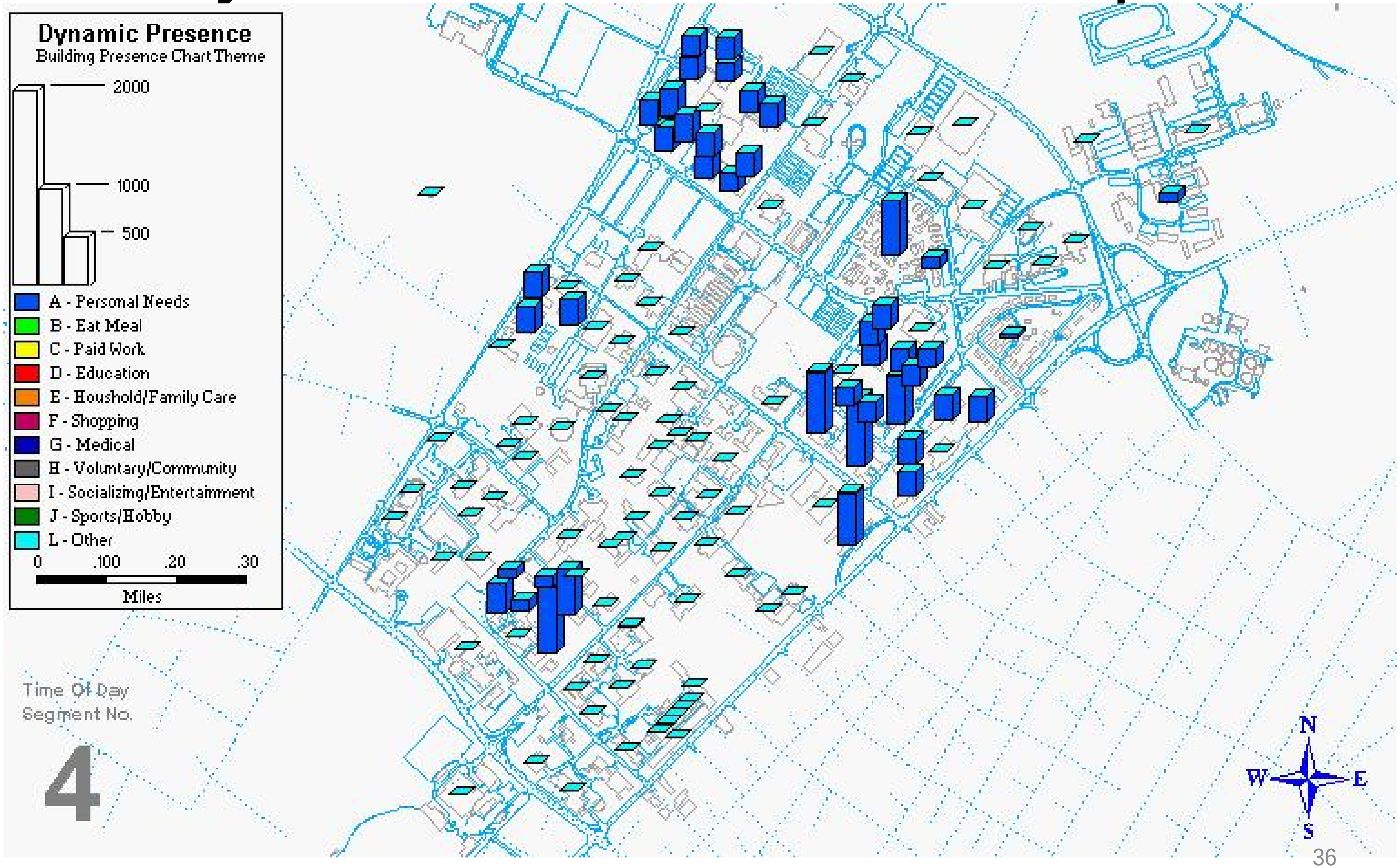
Dynamic Presence on Campus



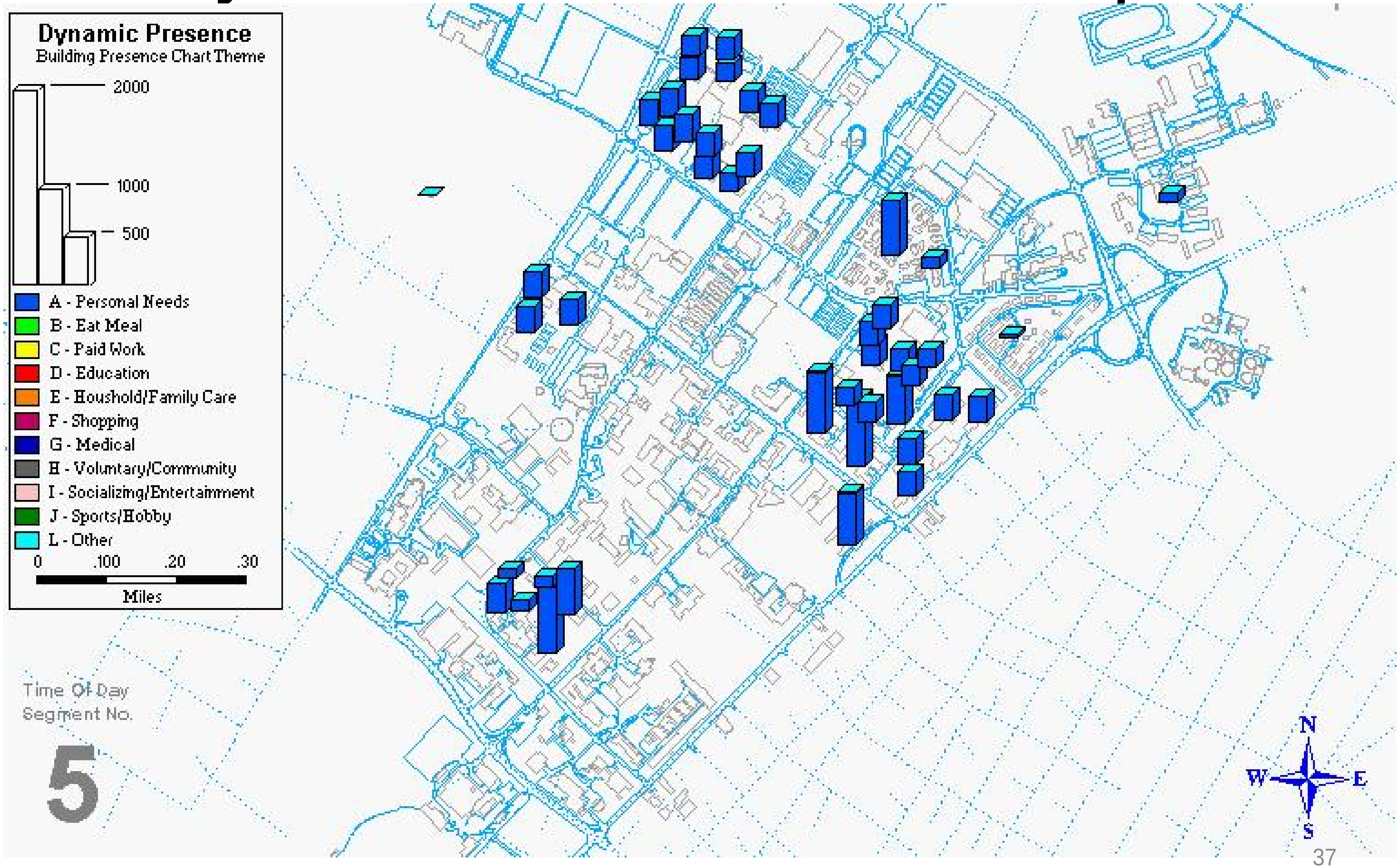
Dynamic Presence on Campus



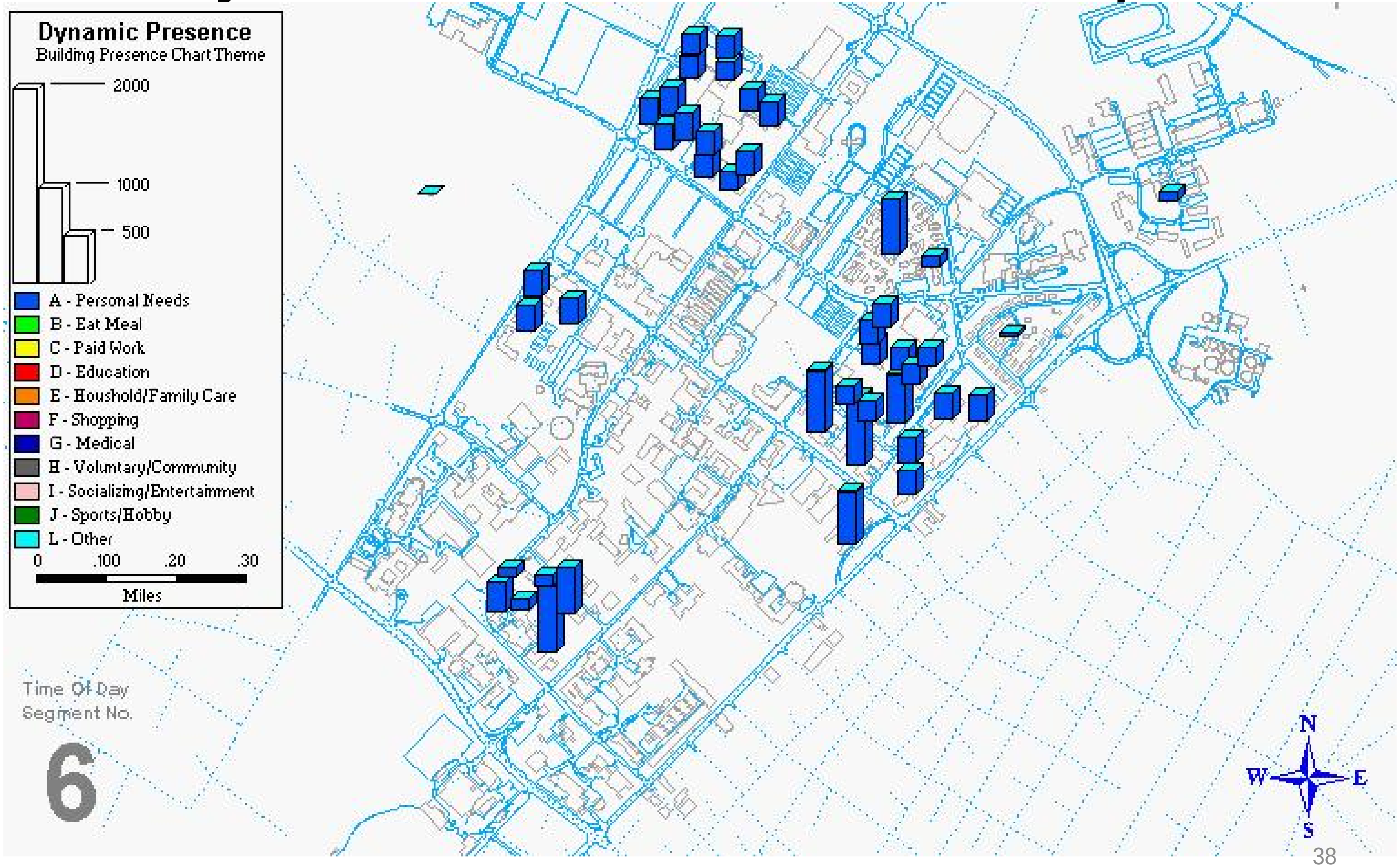
Dynamic Presence on Campus



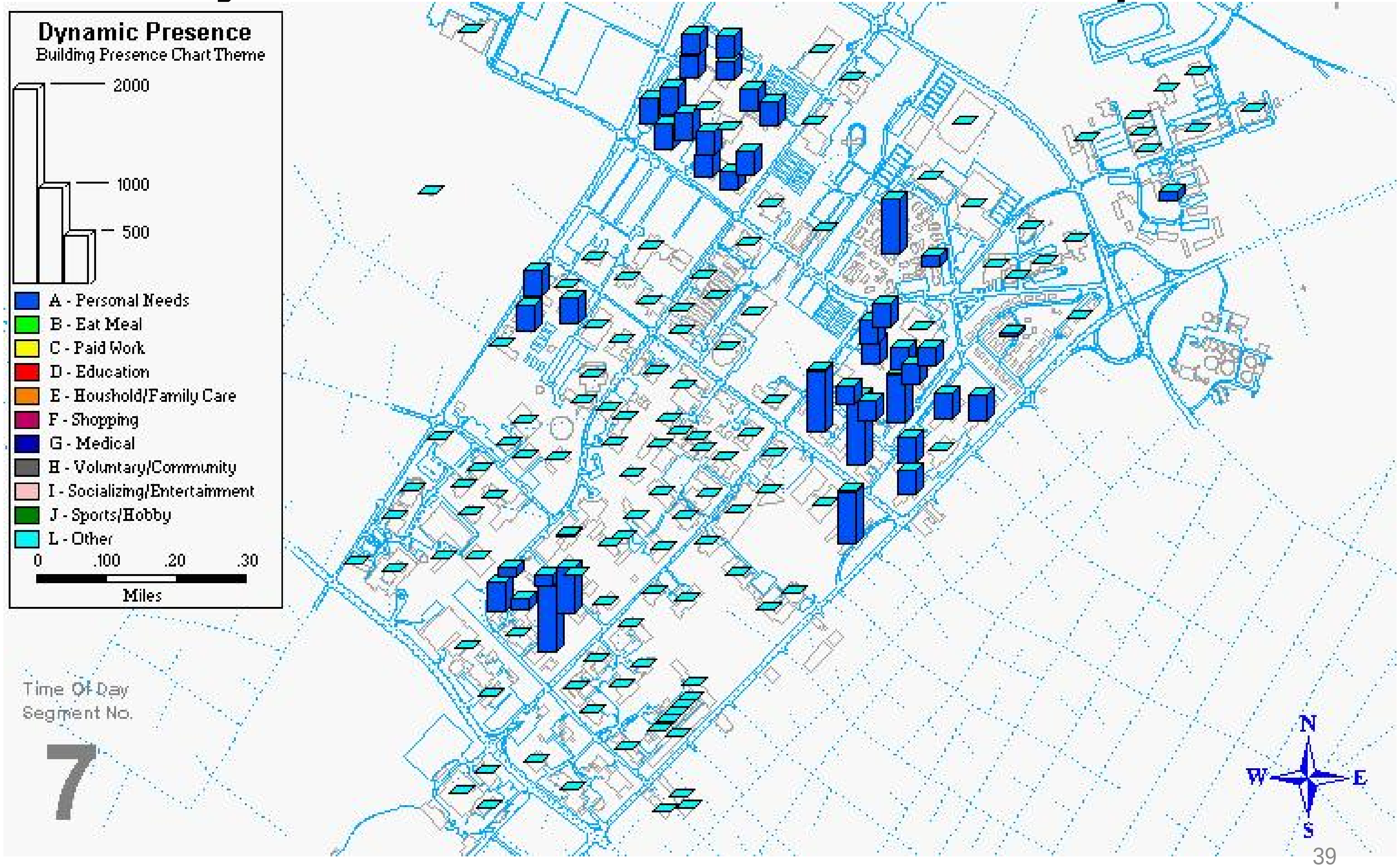
Dynamic Presence on Campus



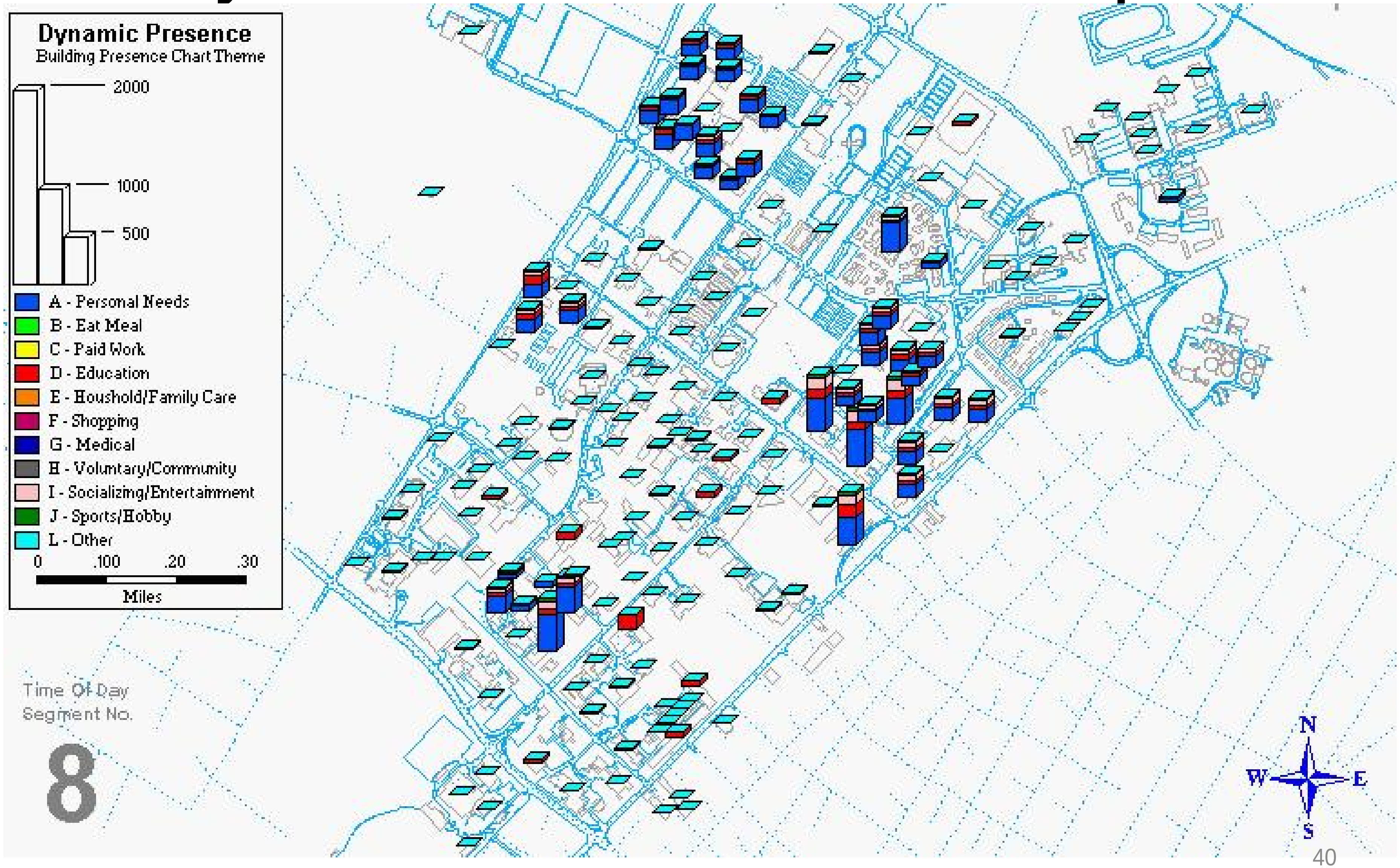
Dynamic Presence on Campus



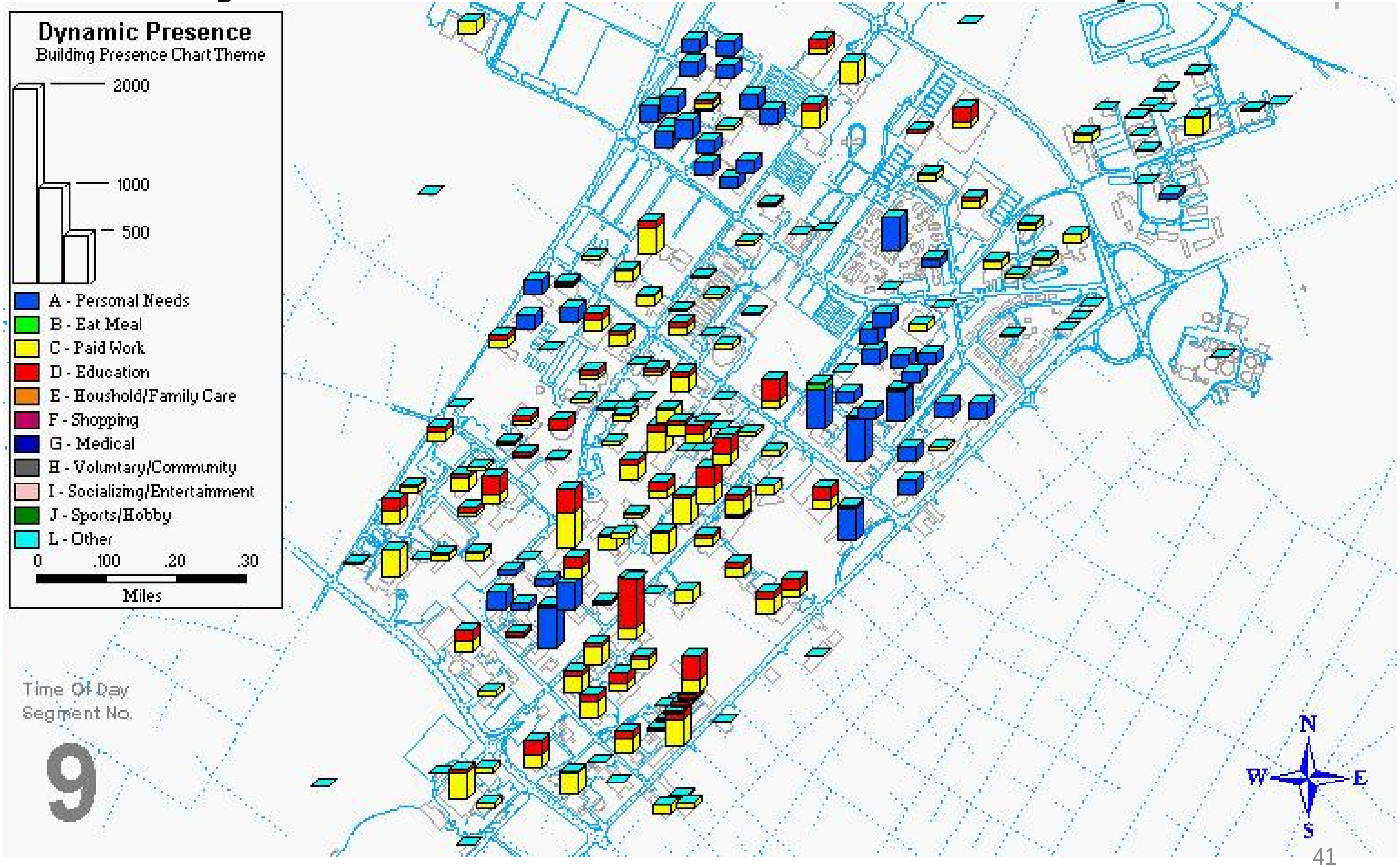
Dynamic Presence on Campus



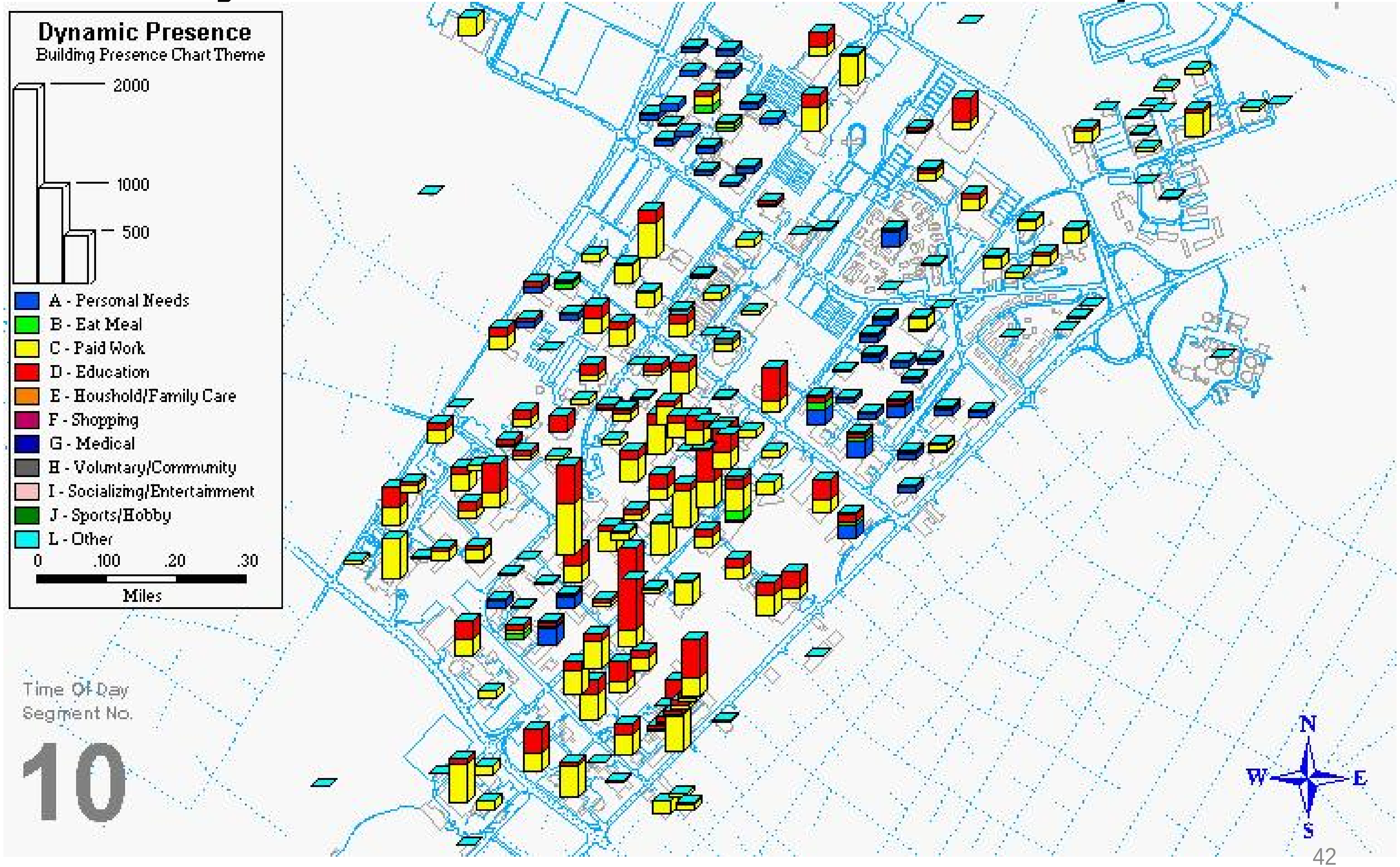
Dynamic Presence on Campus



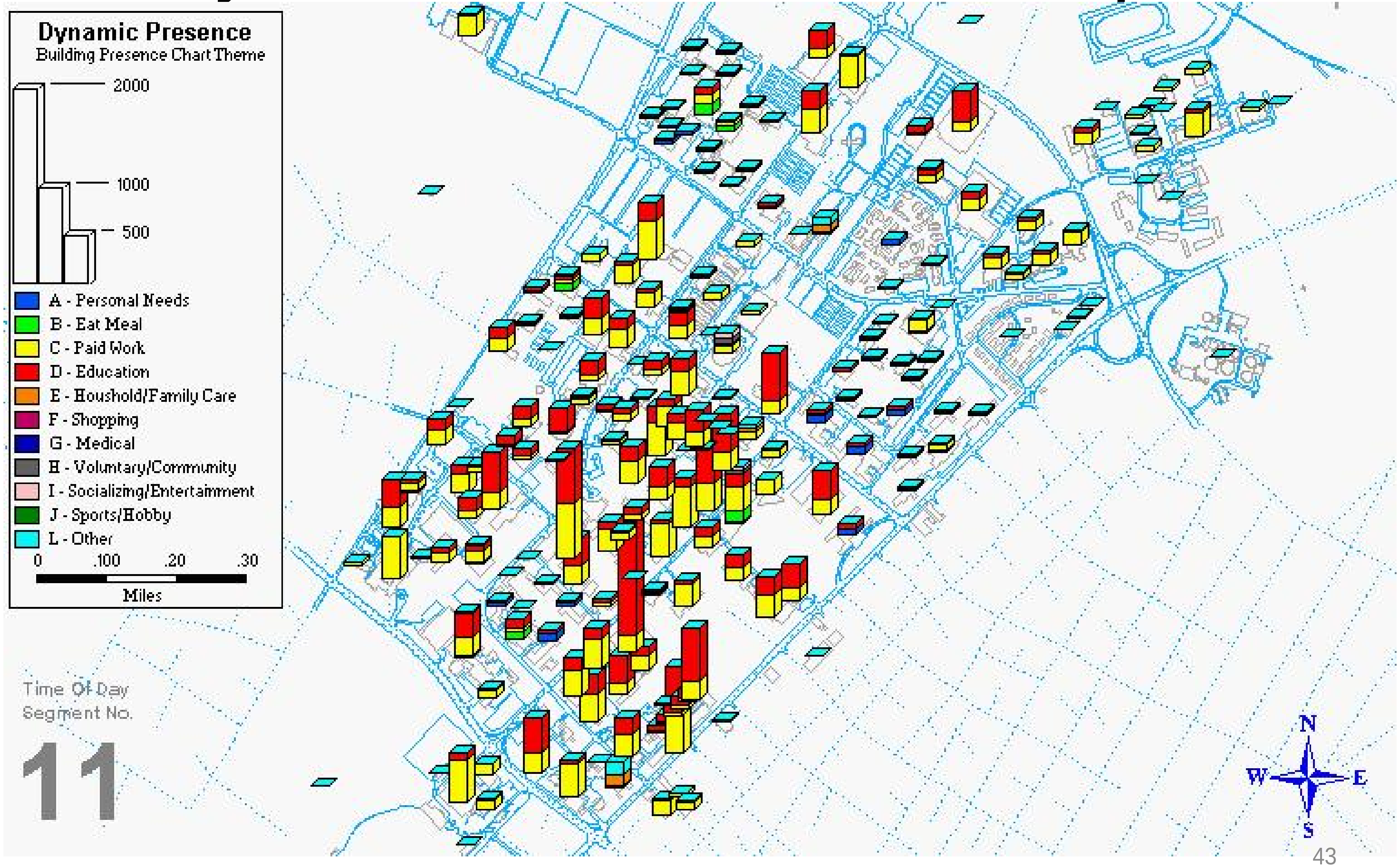
Dynamic Presence on Campus



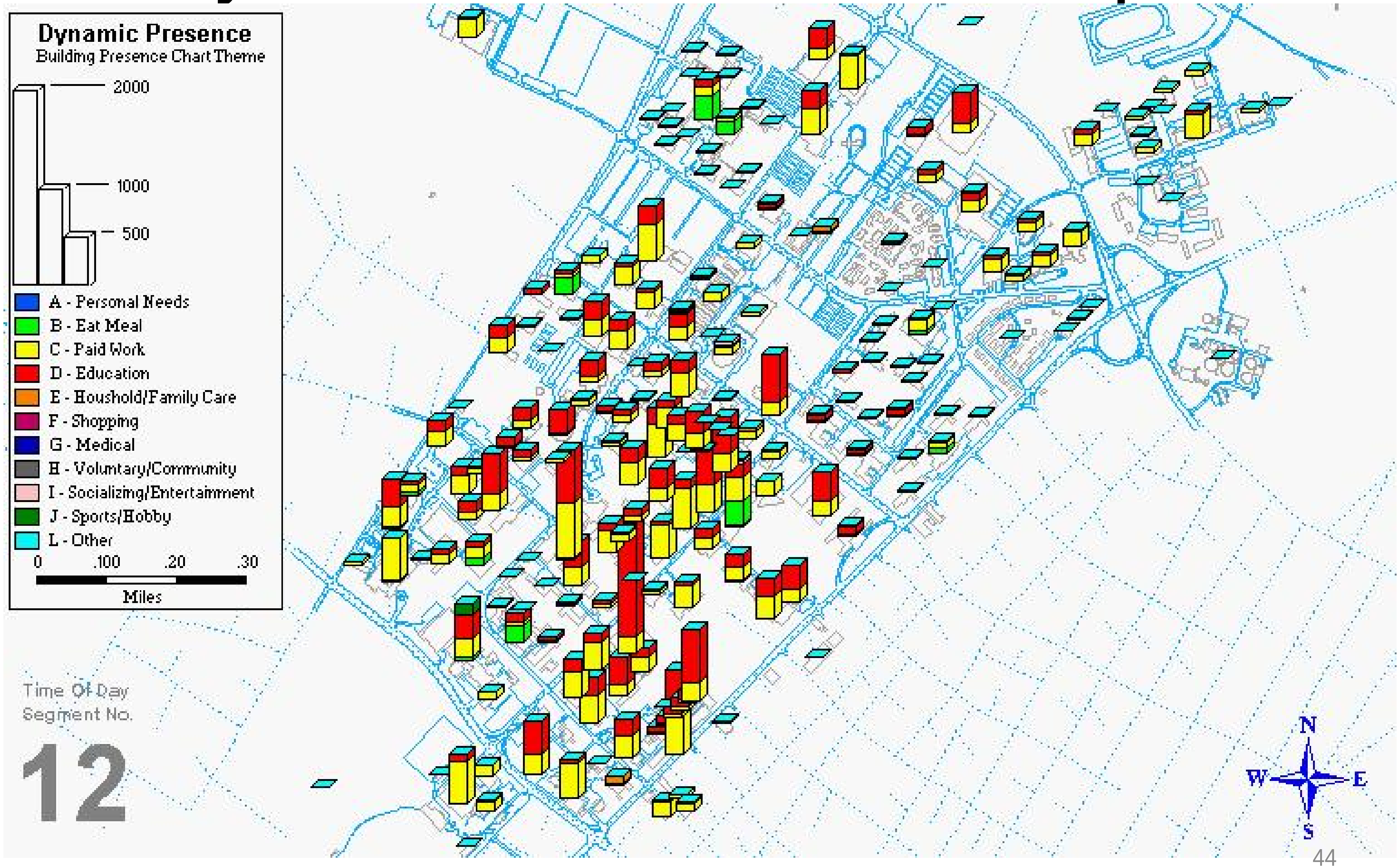
Dynamic Presence on Campus



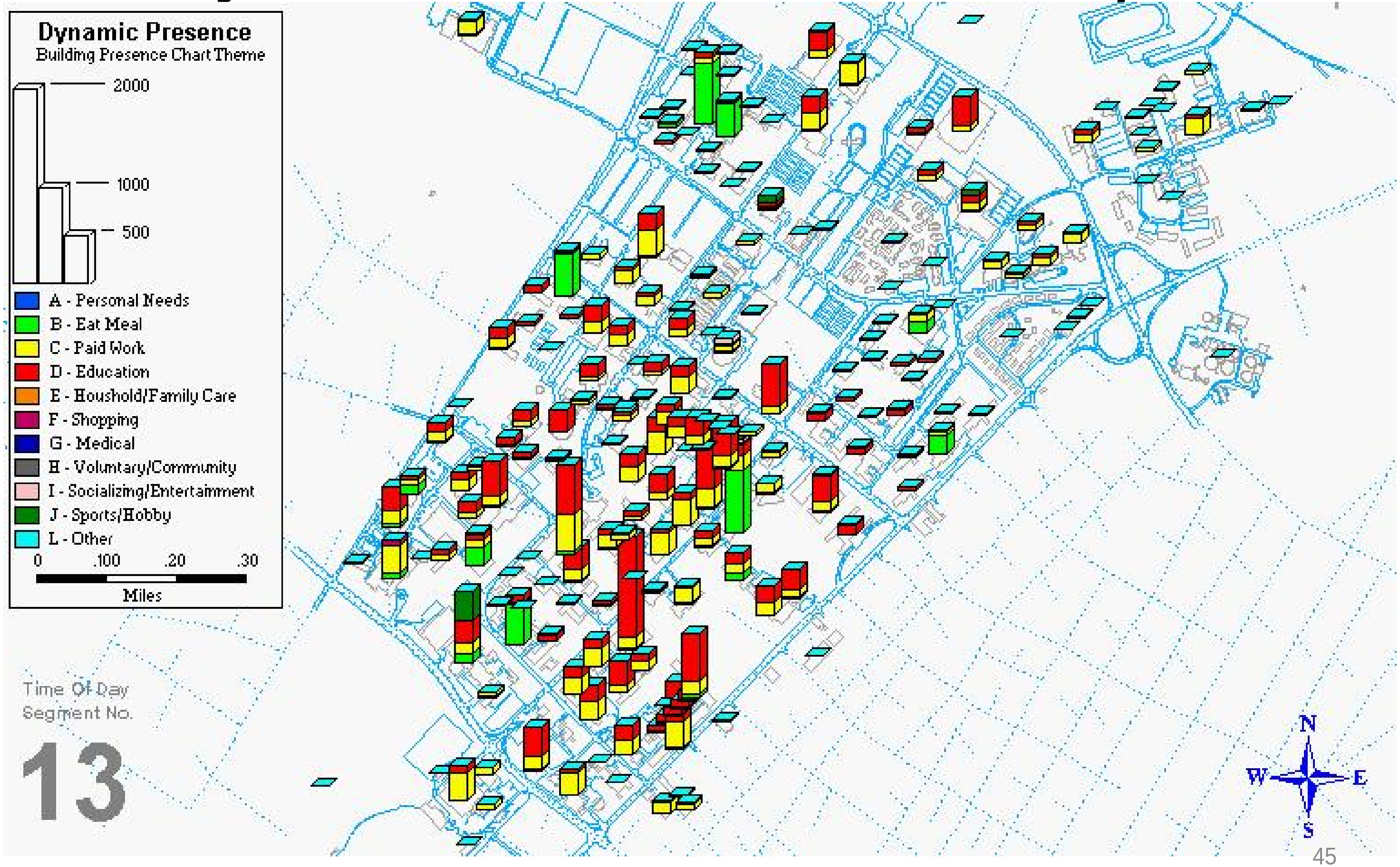
Dynamic Presence on Campus



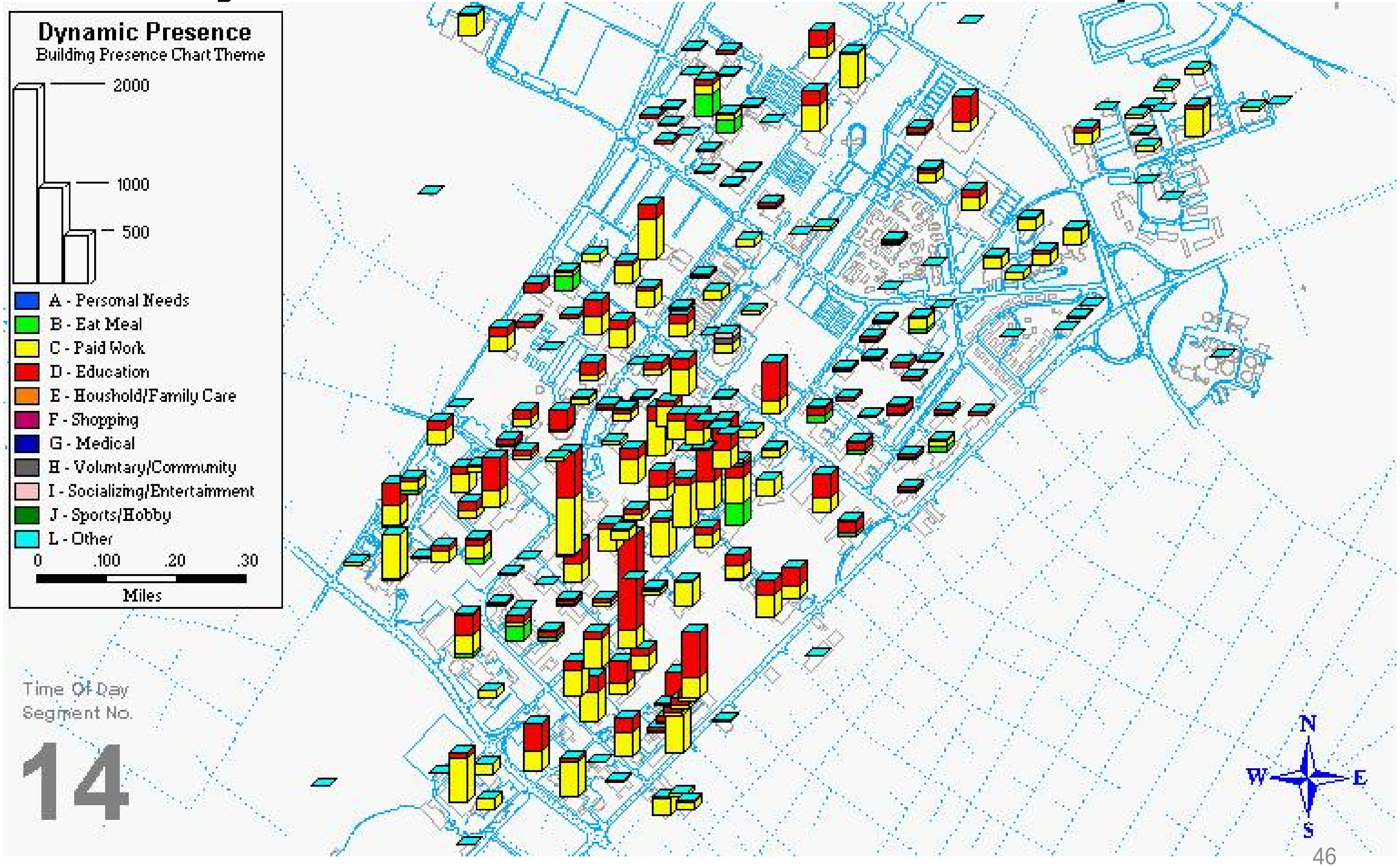
Dynamic Presence on Campus



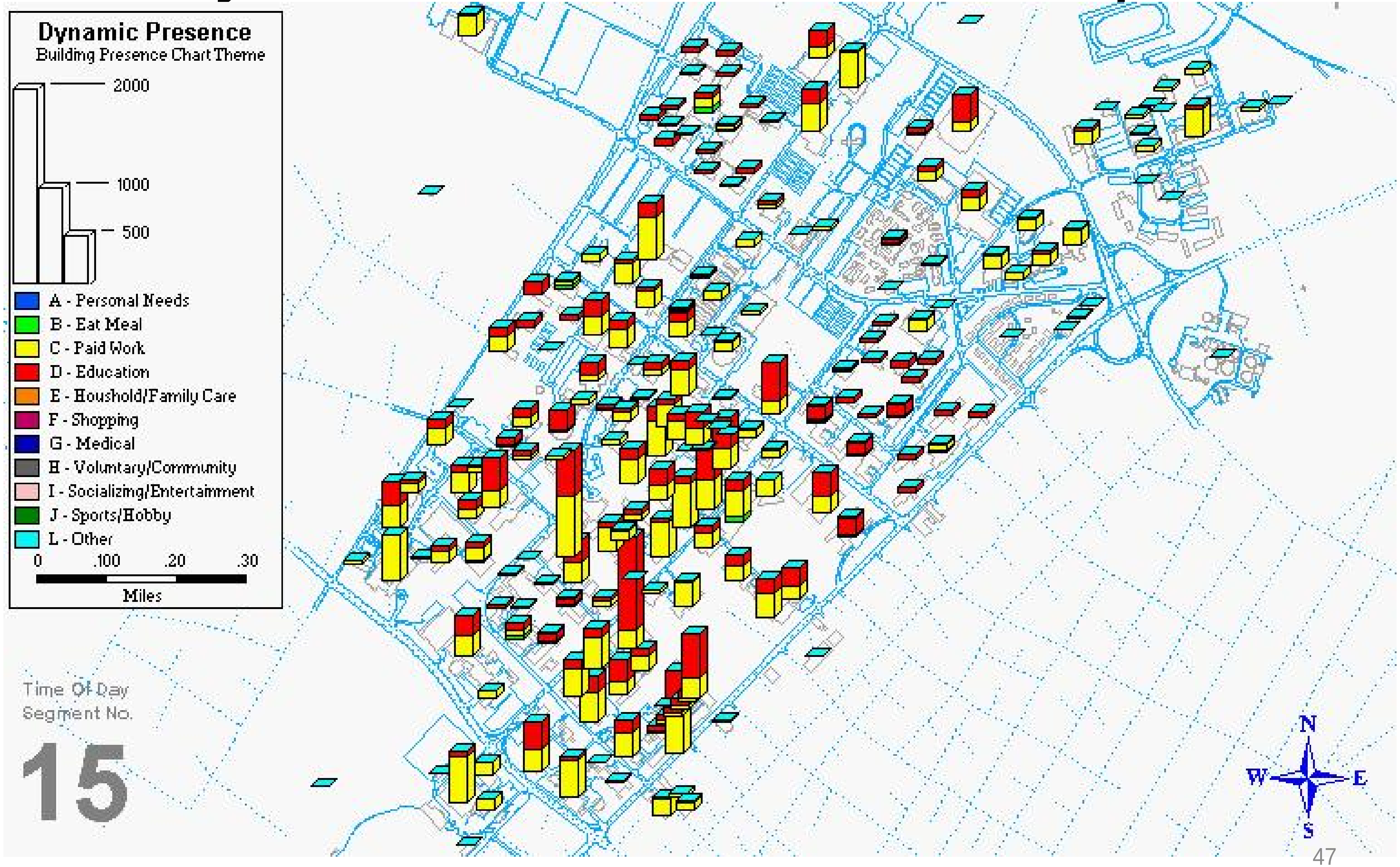
Dynamic Presence on Campus



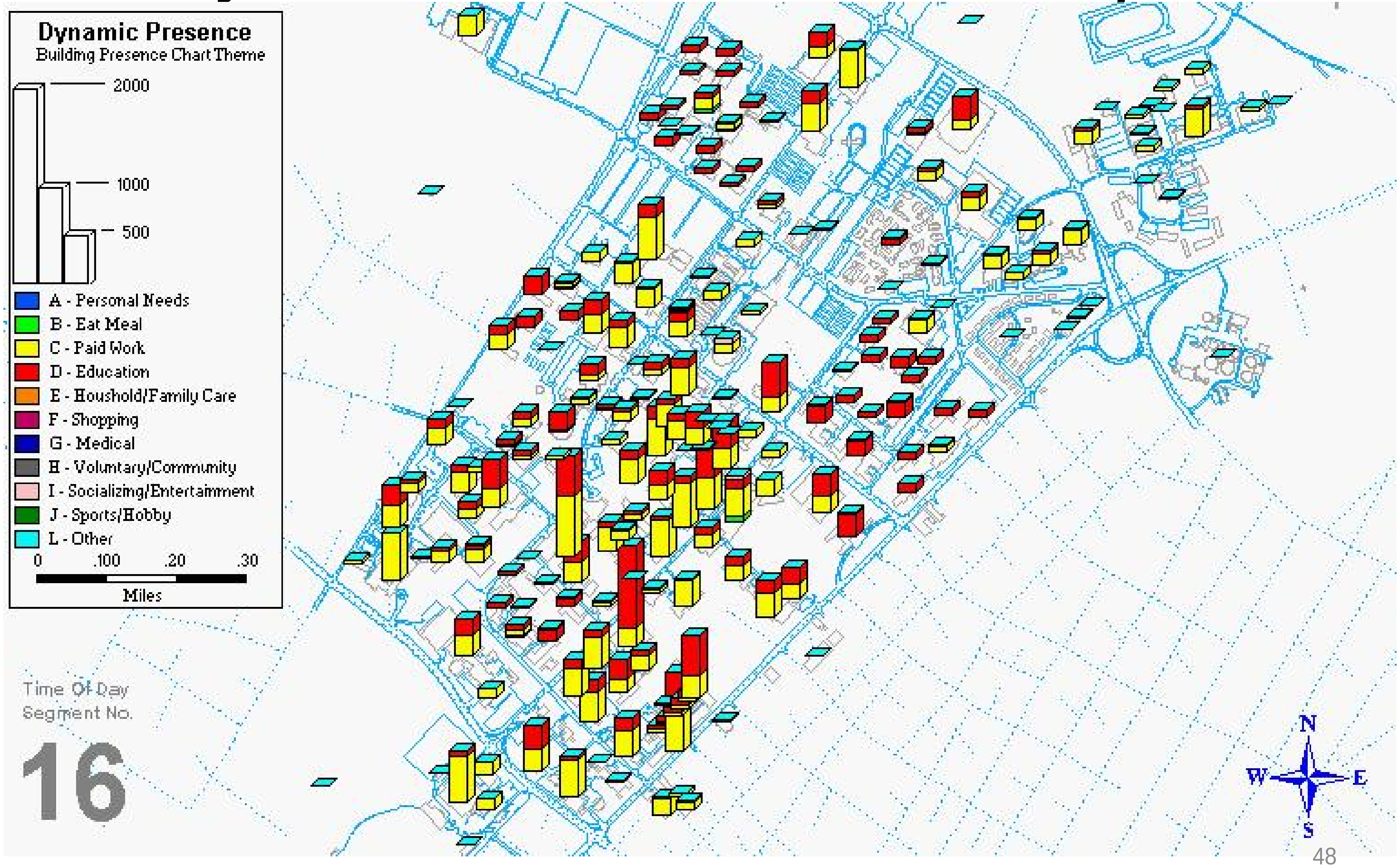
Dynamic Presence on Campus



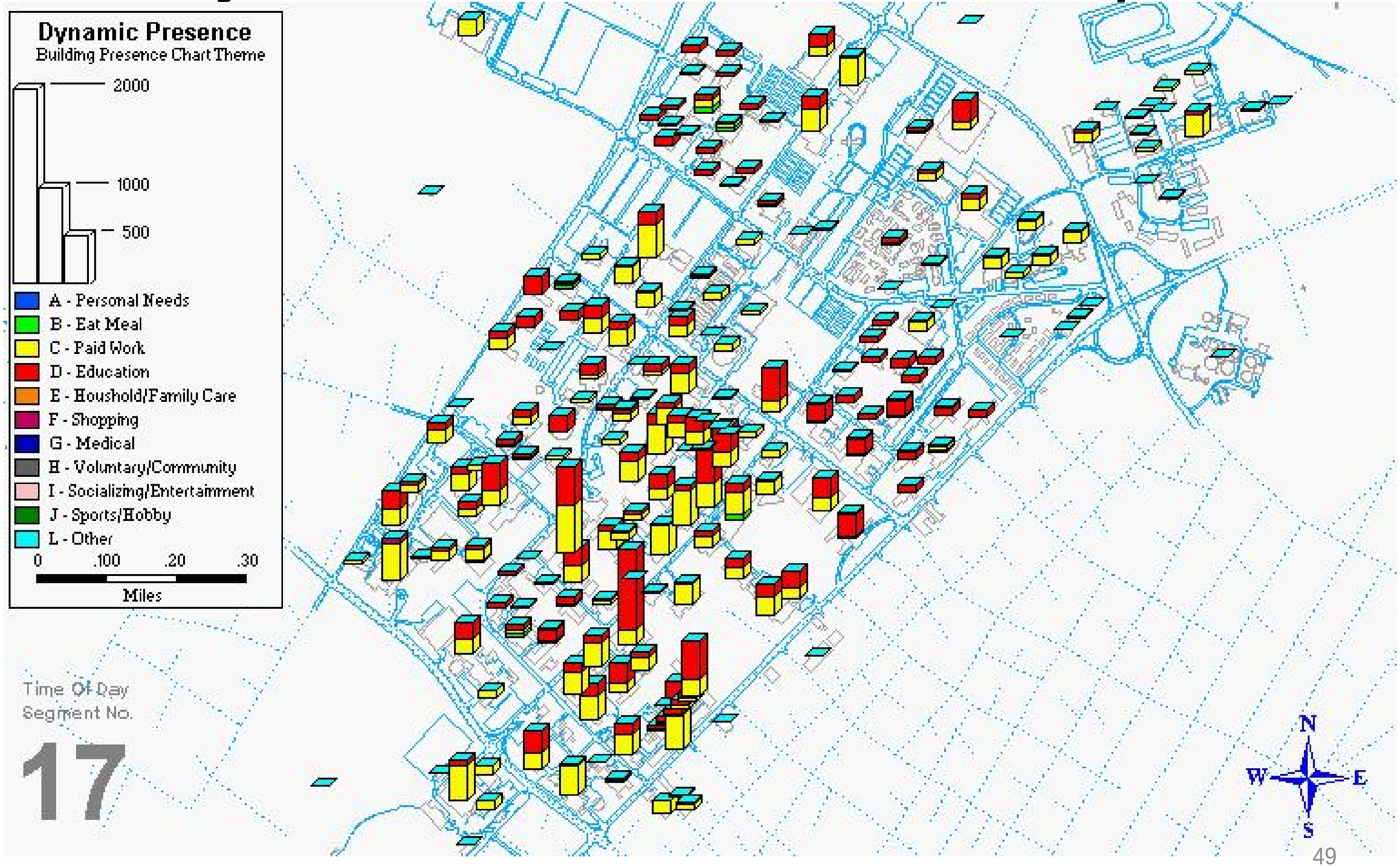
Dynamic Presence on Campus



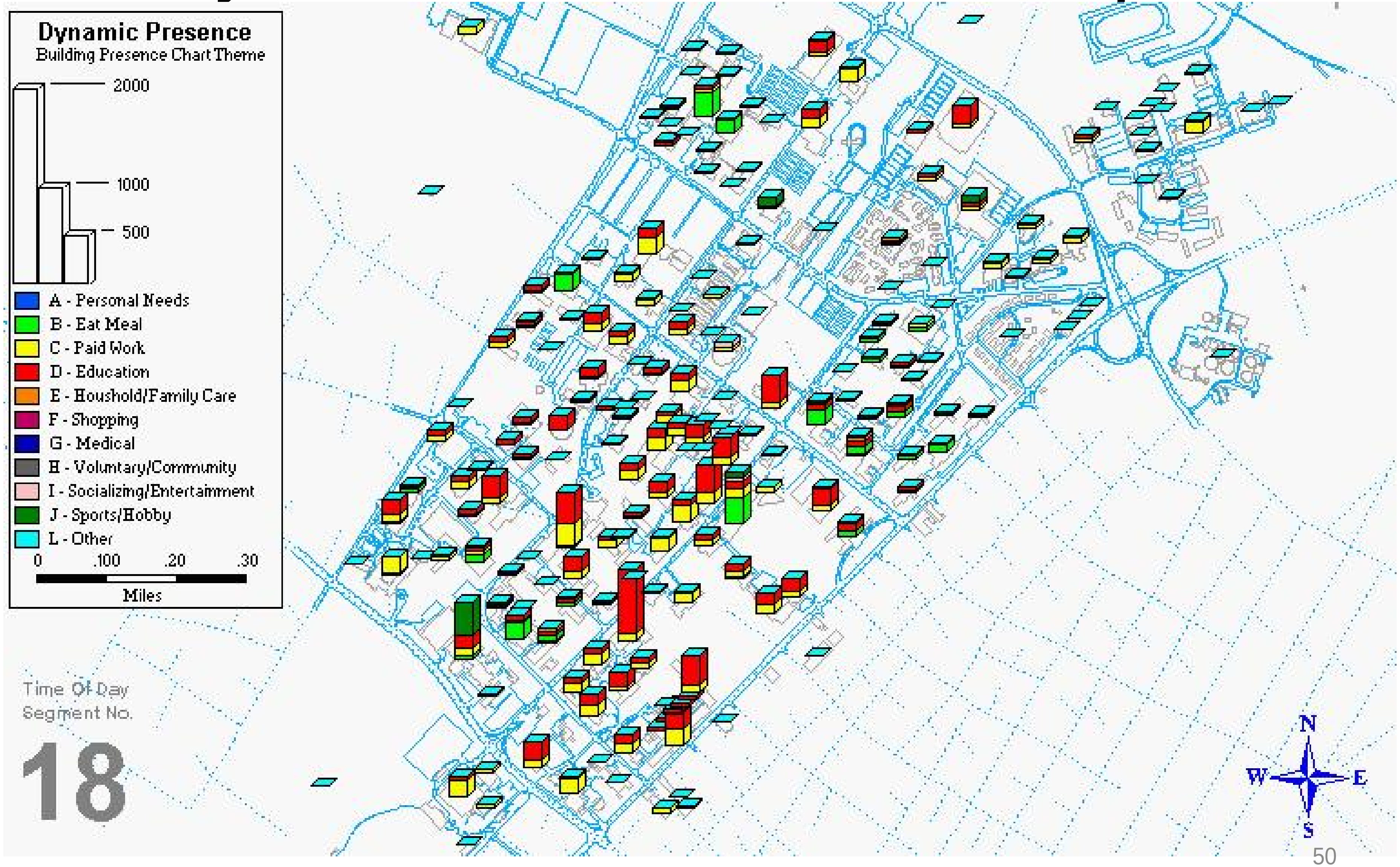
Dynamic Presence on Campus



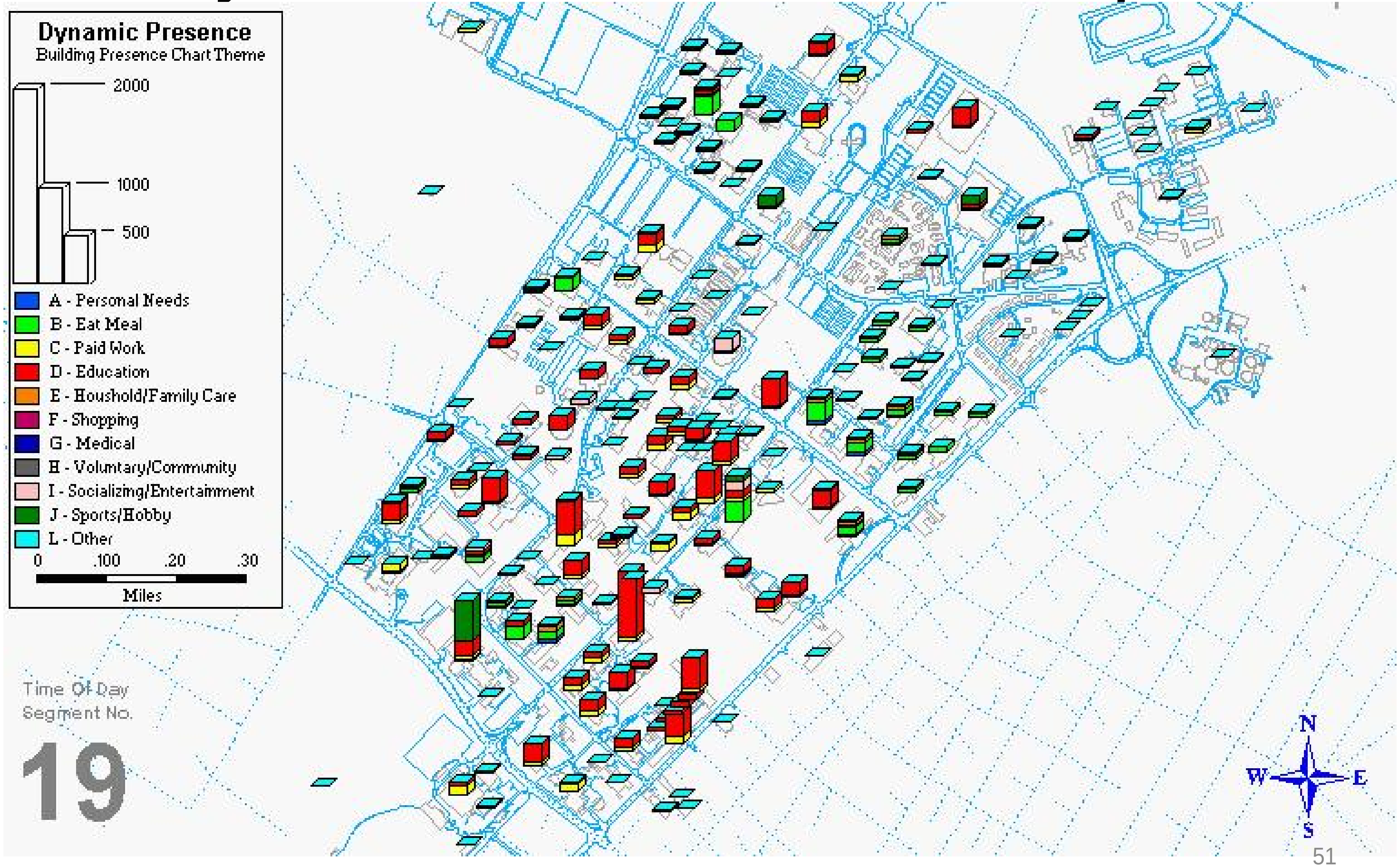
Dynamic Presence on Campus



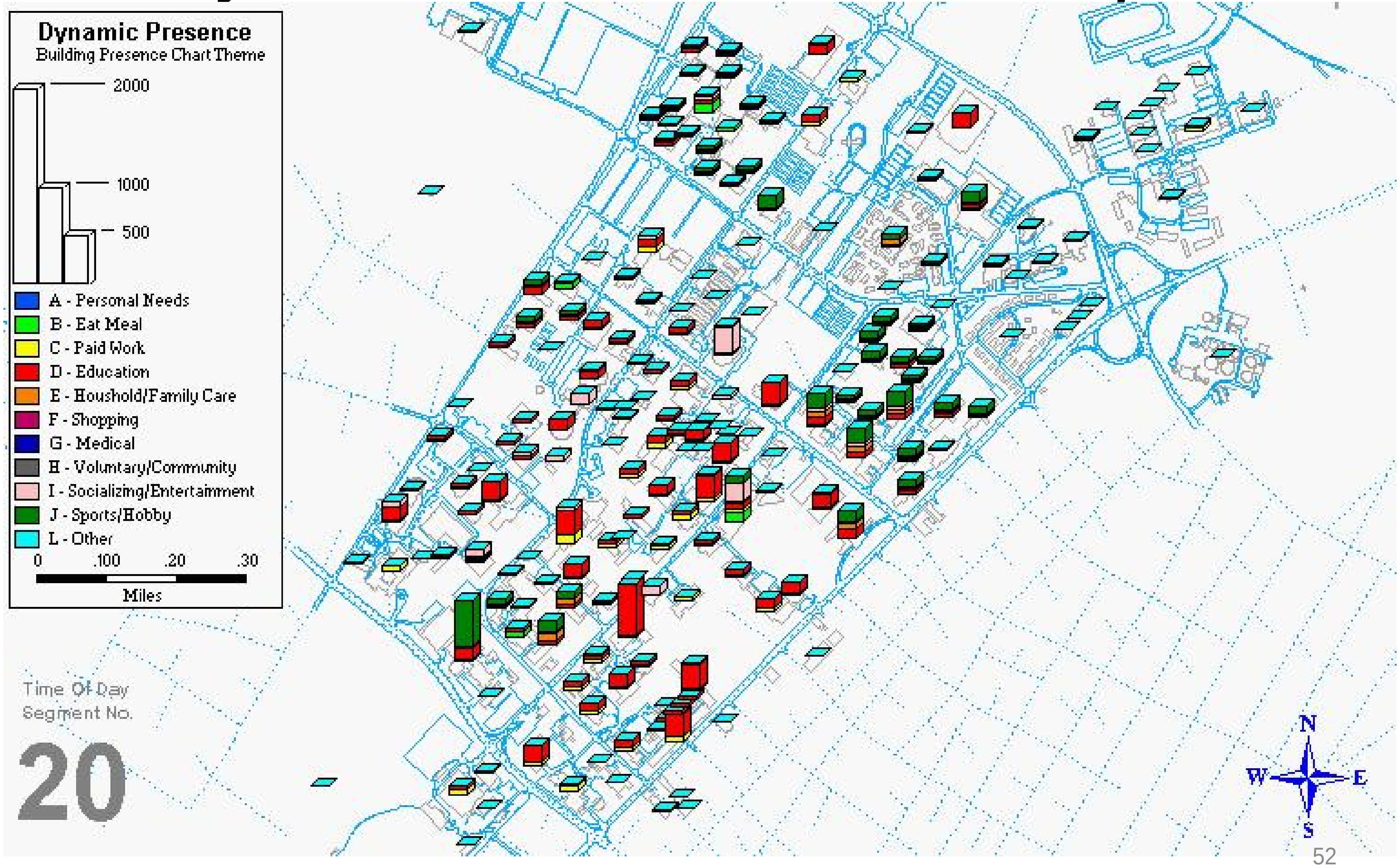
Dynamic Presence on Campus



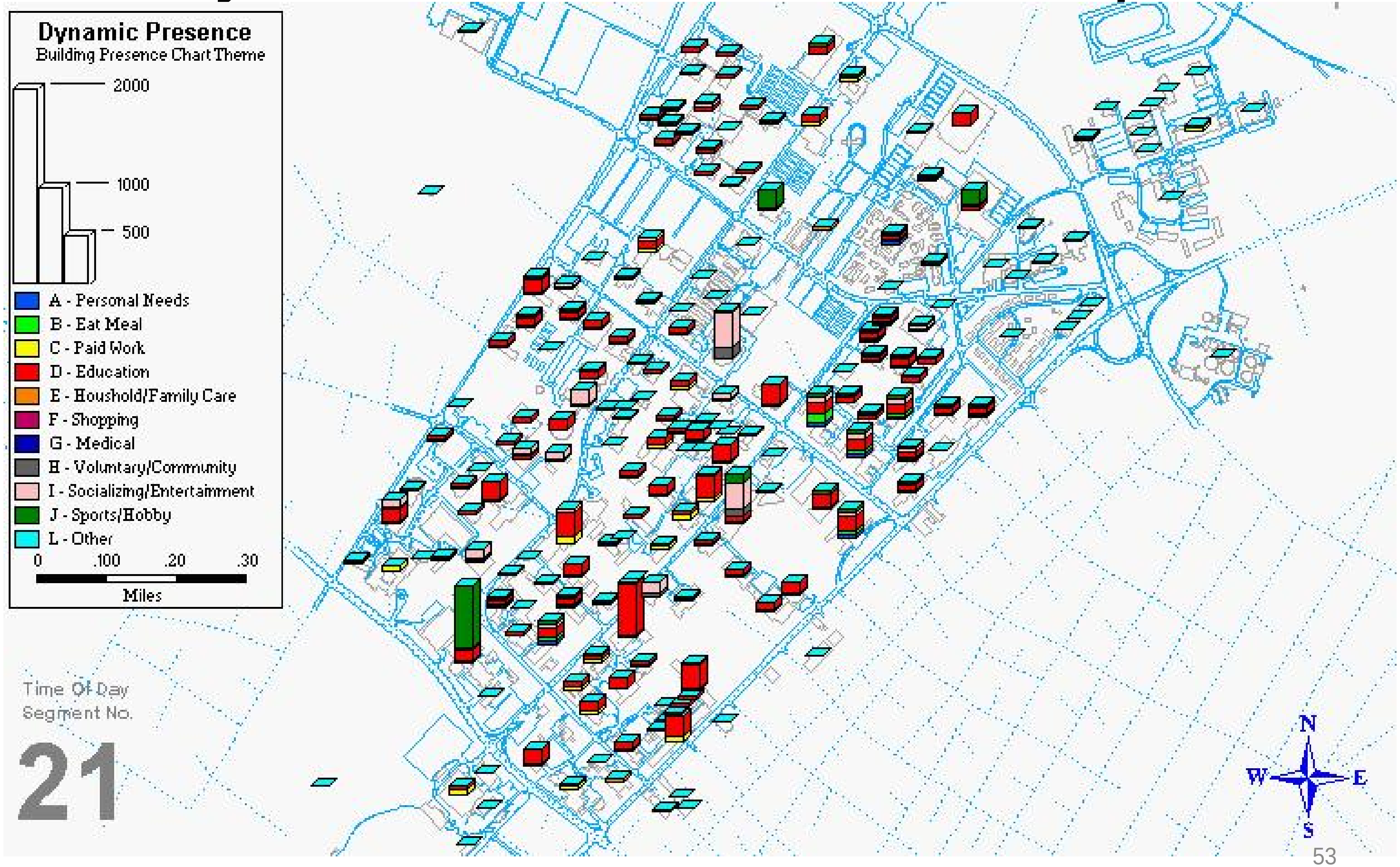
Dynamic Presence on Campus



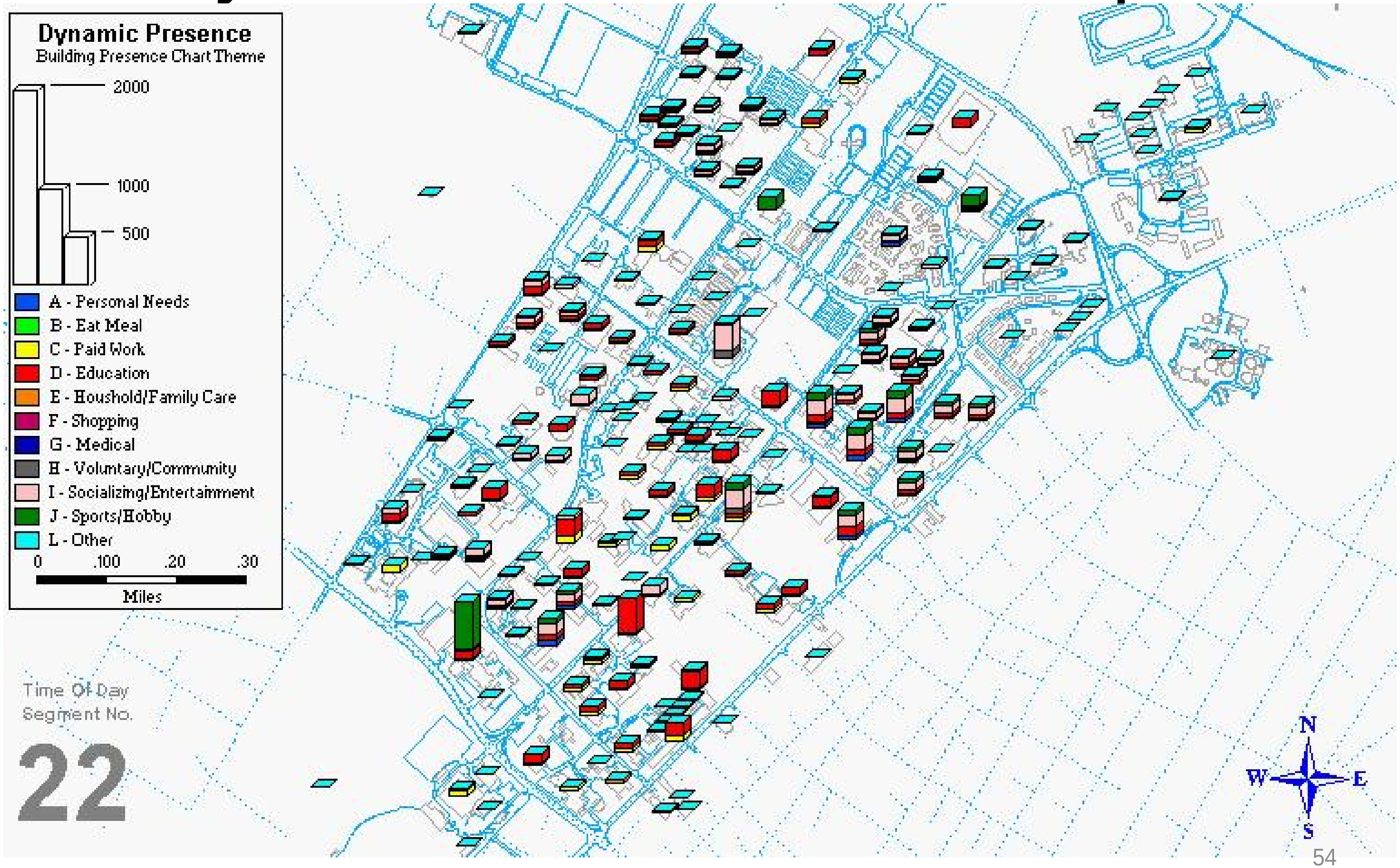
Dynamic Presence on Campus



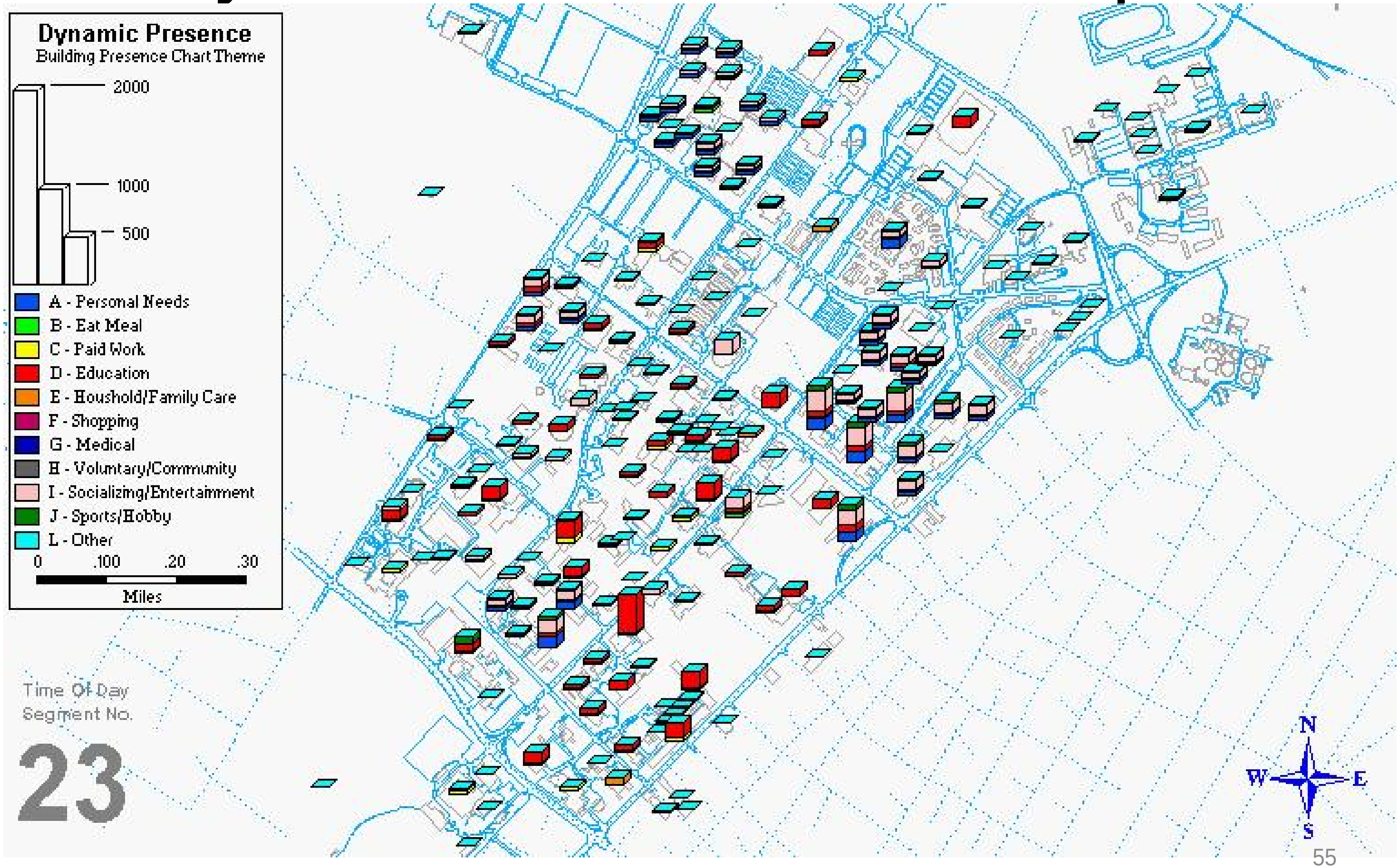
Dynamic Presence on Campus



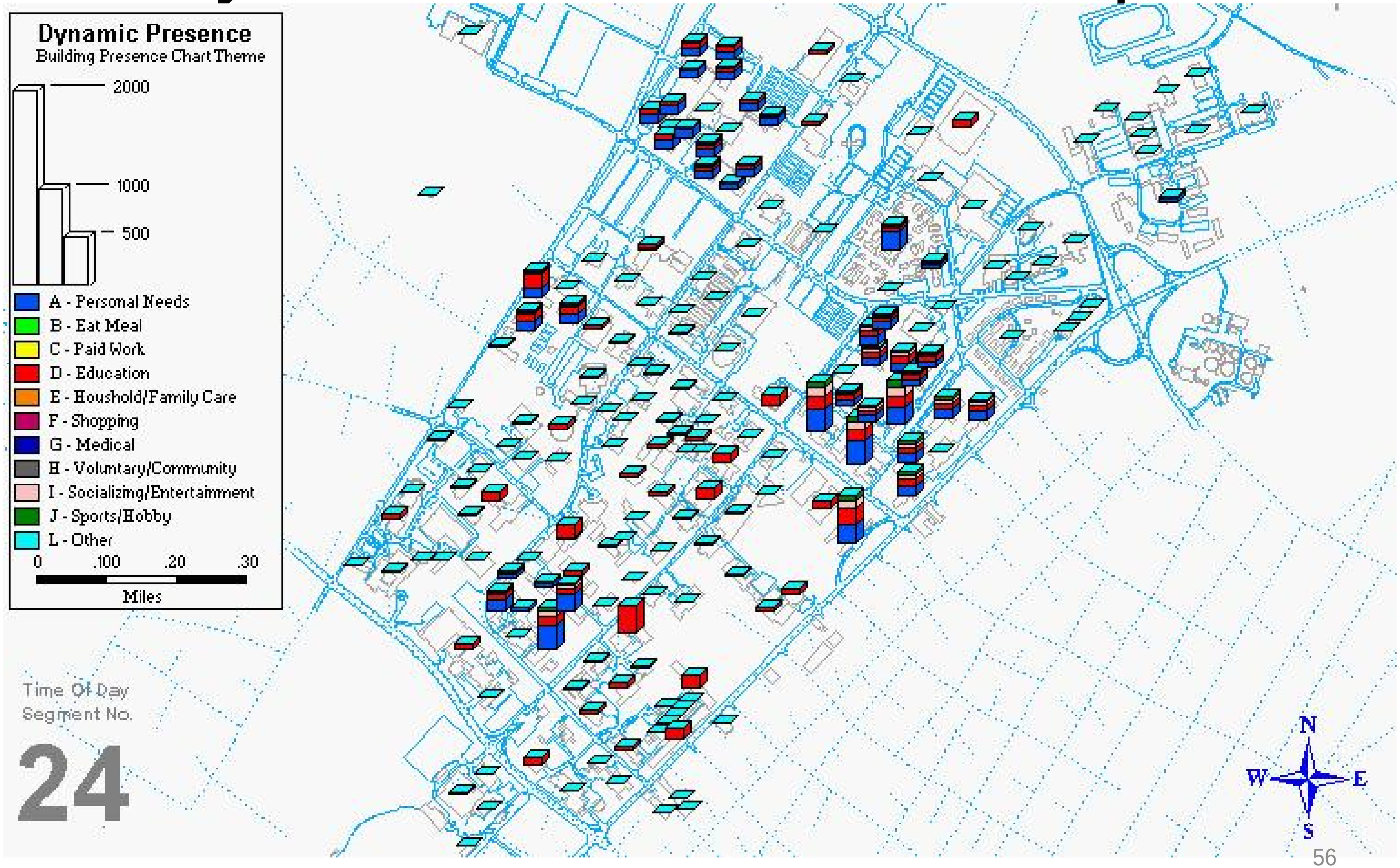
Dynamic Presence on Campus



Dynamic Presence on Campus

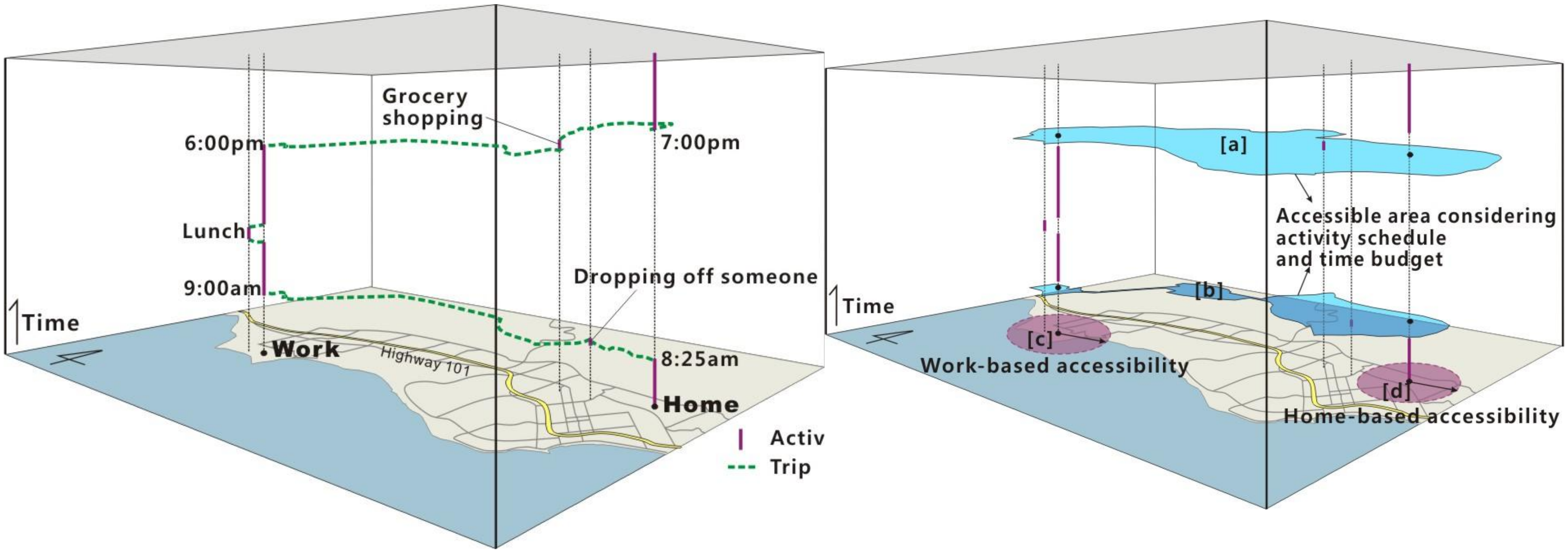


Dynamic Presence on Campus



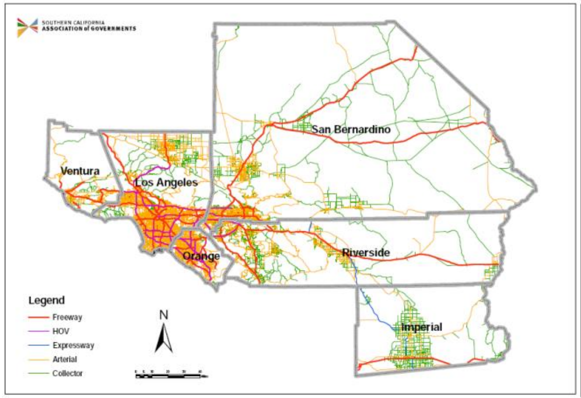
What should we expect to see next?

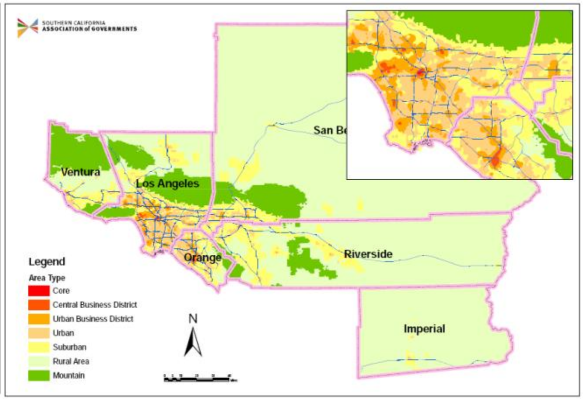
Accessibility measurement from individual space-time path (Seo Youn Yoon Ph.D.)



- Space-time path of an individual for a day.
- Accessibility measures
  [a, b] Accessibility measured based on activity schedule and time budget.
  Time budget for [a]: 60 minutes, time budget for [b]: 35 minutes
  [c, d] Accessibility measured from home and work location based on distance

SCAG ACTIVITY-BASED TRAVEL DEMAND MODEL DEVELOPMENT: Development of SimAGENT





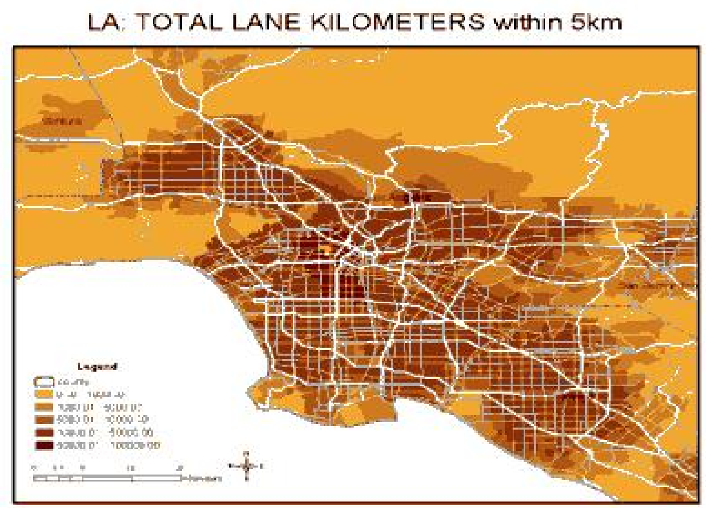
Kostas Goulias
University of California
Santa Barbara

Ram Pendyala
Arizona State University
Tempe

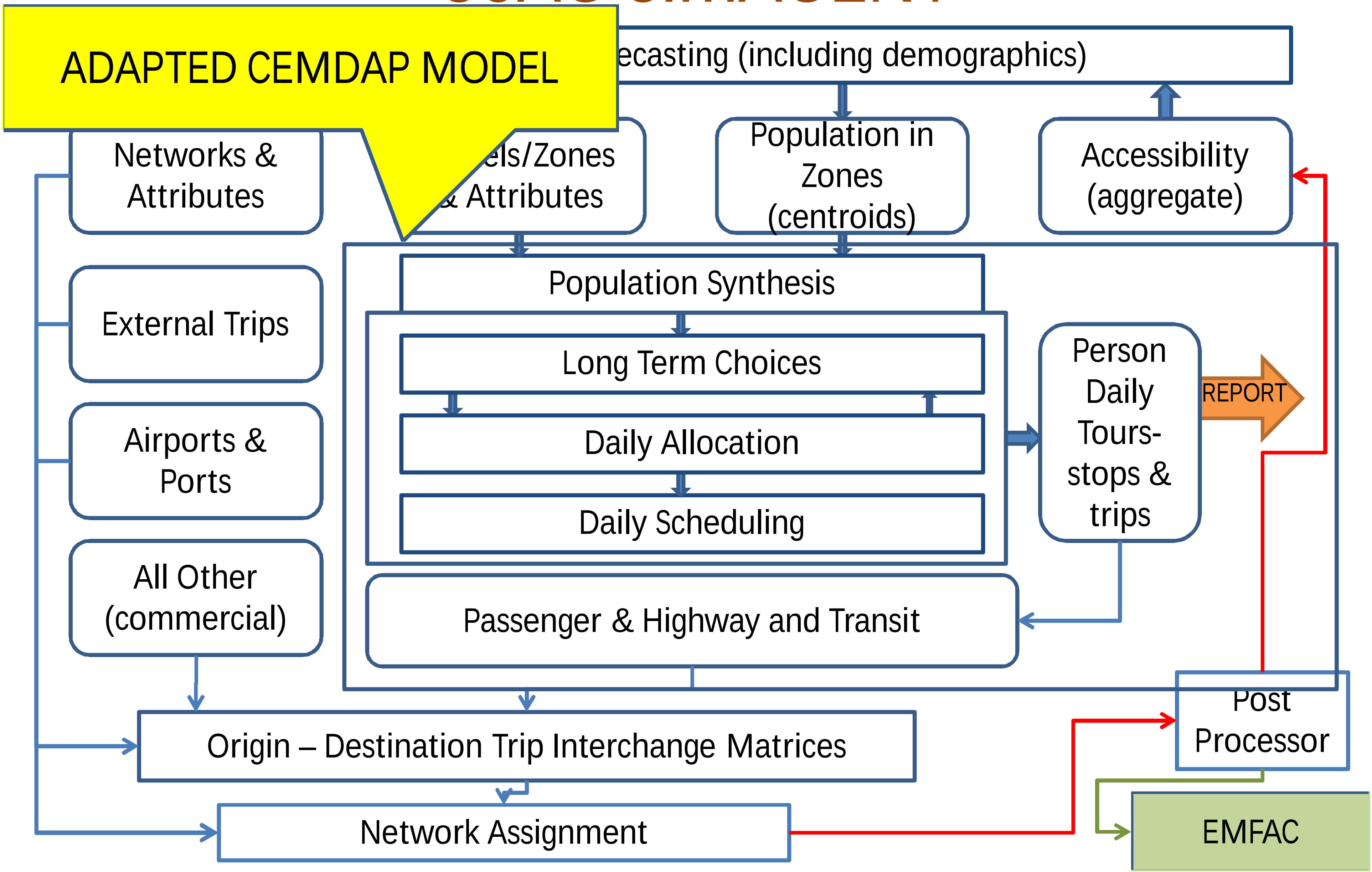
Chandra Bhat
The University of Texas
Austin

Planning Context

- SCAG region is large and complex!
  - Six counties – 188 cities – 14 subregions
  - 38,000 square miles with 19 million residents
  - Nation's largest region in terms of both population and size - socially, culturally and economically diverse
  - 15th largest economy in the world

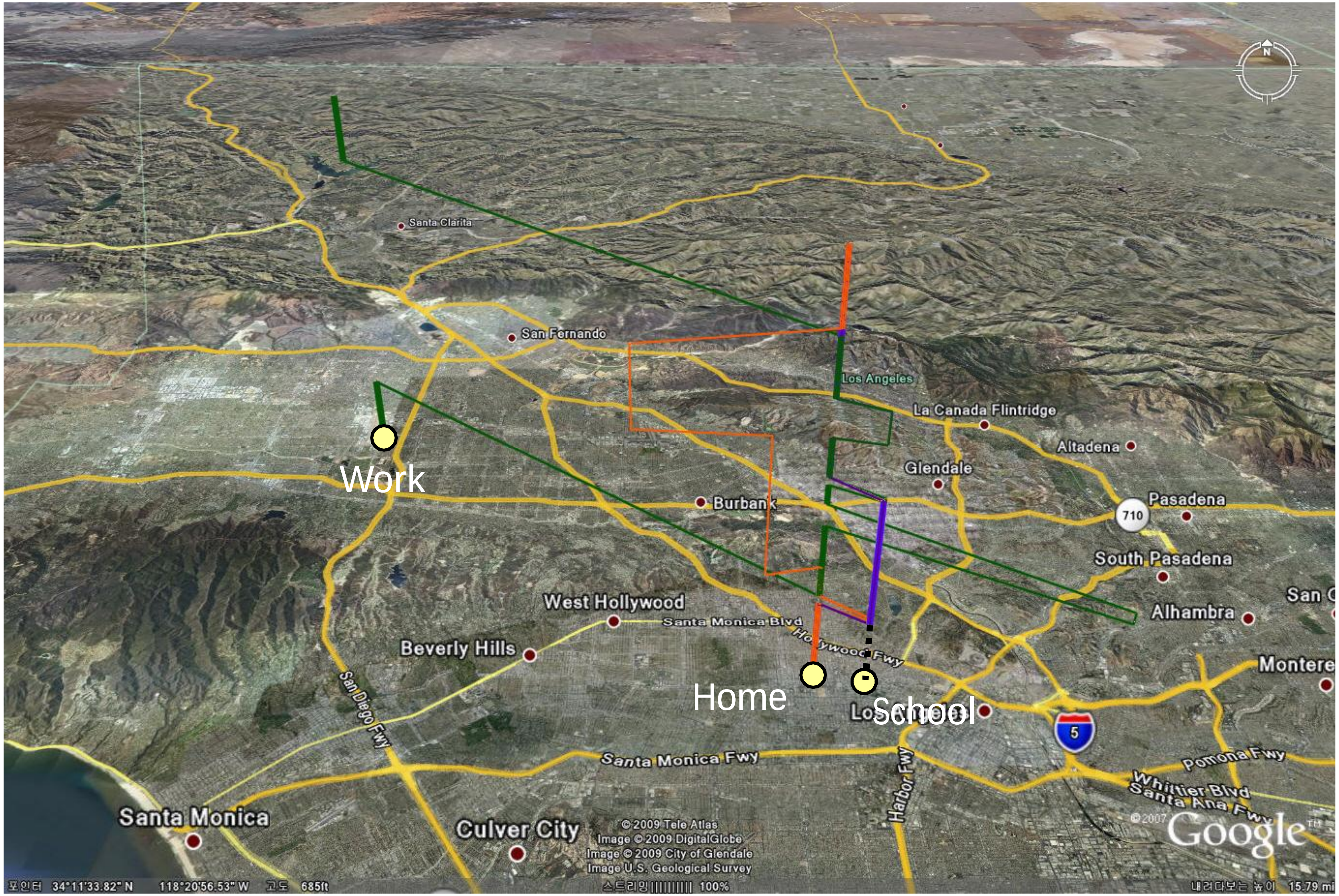


Phase 1: Adapt CEMDAP-DFW to SCAG SimAGENT

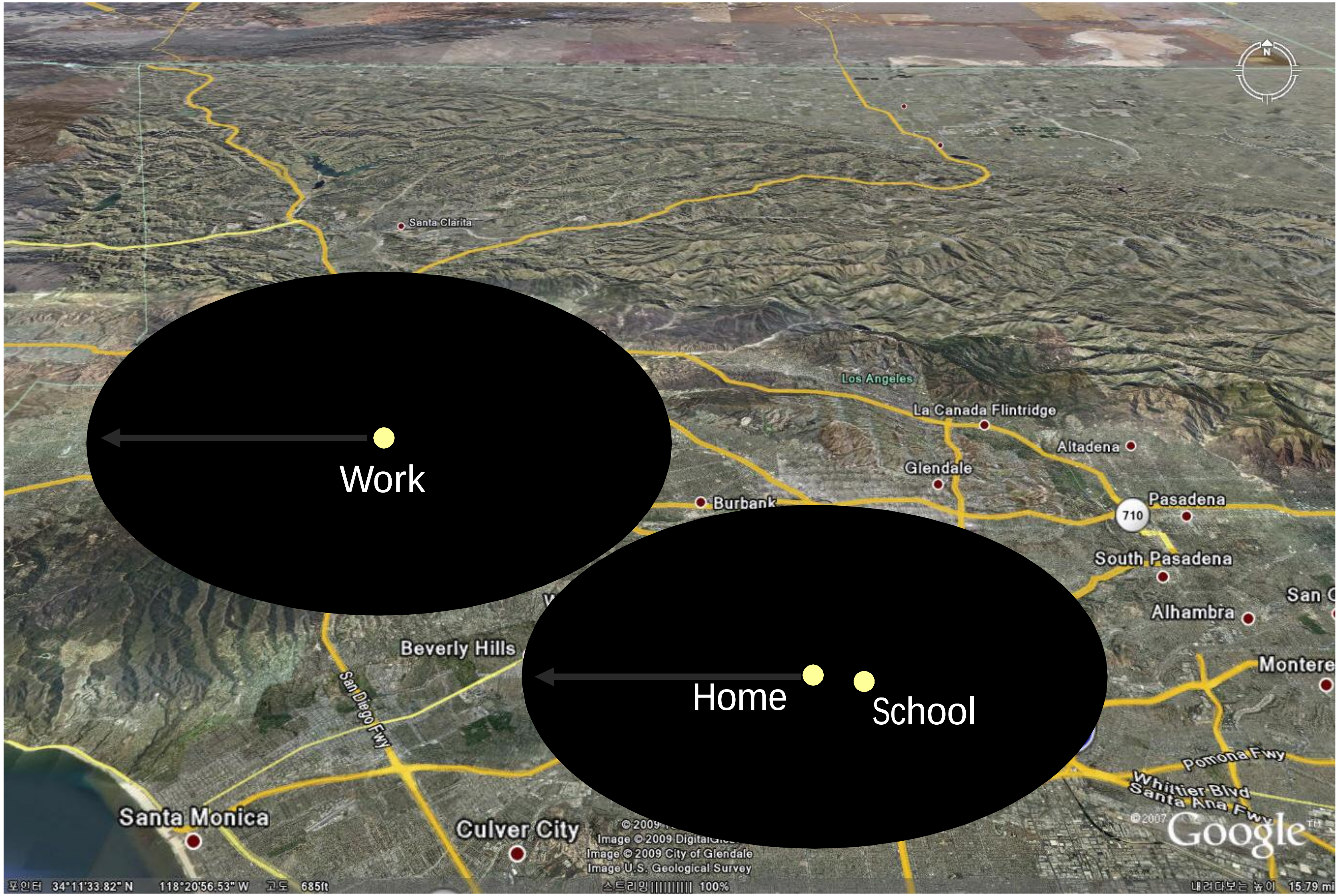


PHASE 2: Development of Advanced Version of SimAGENT

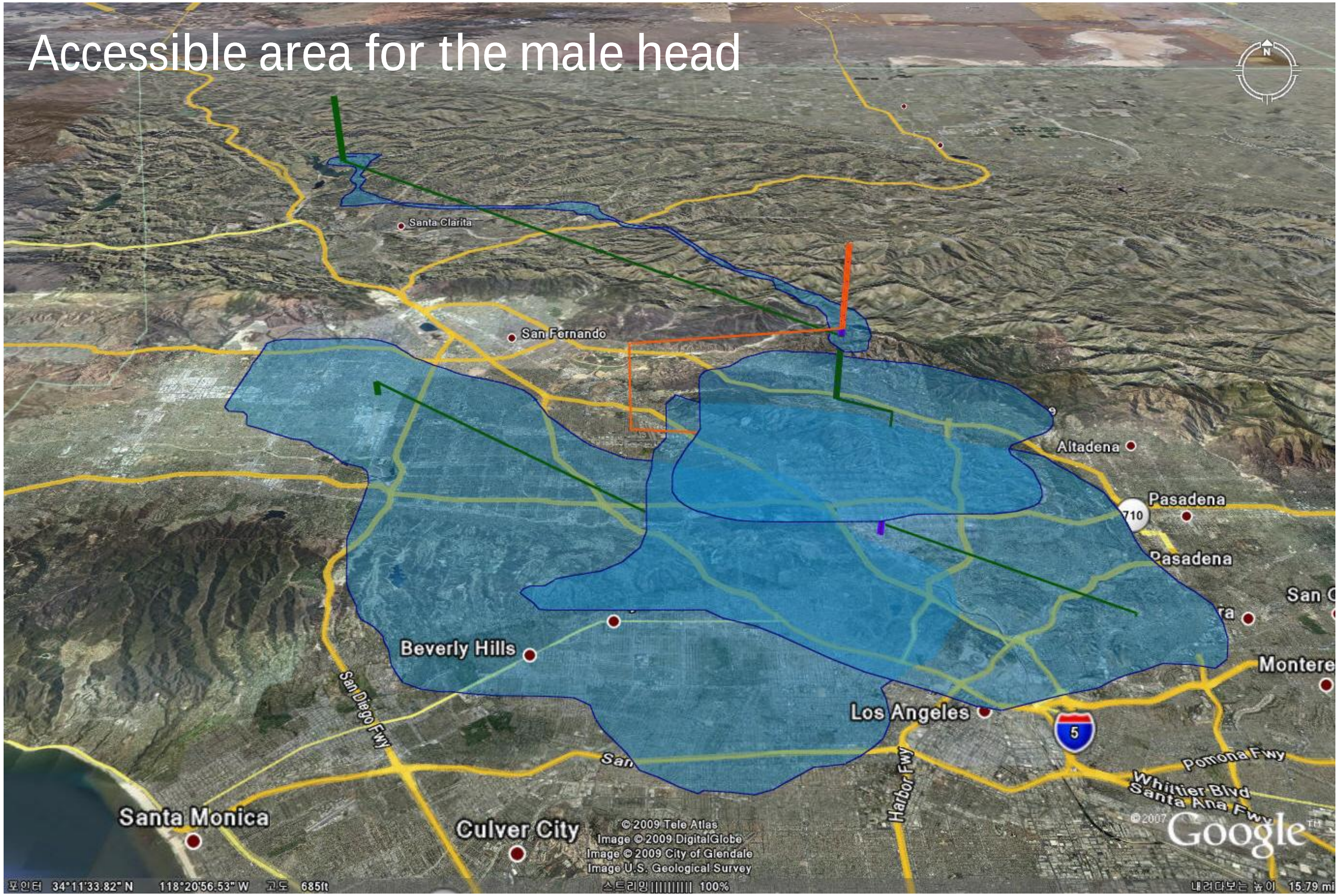
- Defined in detail in Task 1
- Expected to have:
  - Sensitivity to an expanded repertoire of policies
  - Integrated land use influences on travel behavior
  - Enhanced feedback among model components
  - Enhanced reflection of behavioral interactions
  - Integrated interfaces with land use, traffic assignment, and EMFAC and/or MOVES



Male head Female head Child



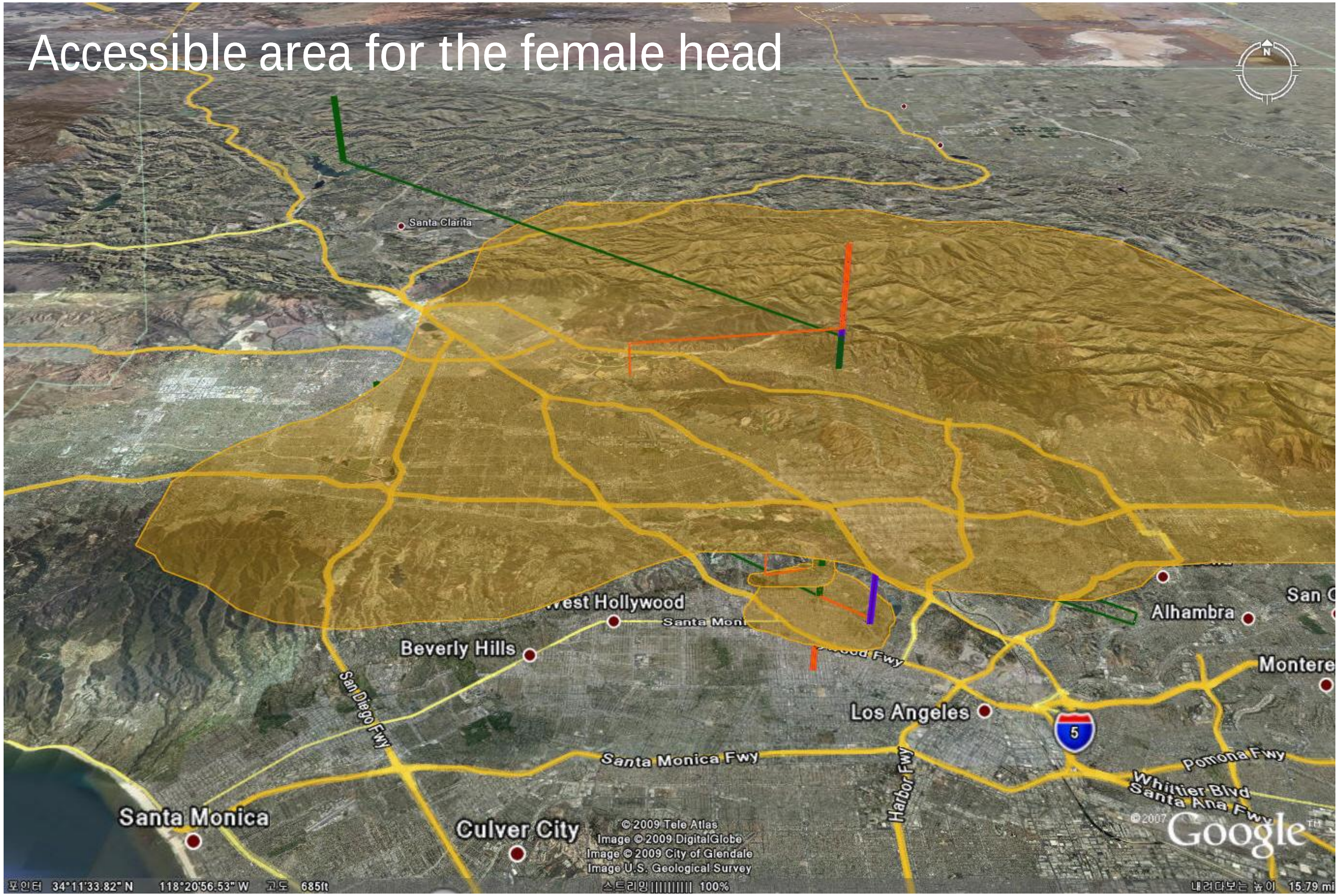
Work
Home
School
Santa Clarita
Los Angeles
La Canada Flintridge
Altadena
Glendale
Burbank
Pasadena
710
South Pasadena
Alhambra
Beverly Hills
San Diego Fwy
Santa Monica
Culver City
Pomona Fwy
Whittier Blvd
Santa Ana Fwy
Image © 2009 City of Glendale
Image U.S. Geological Survey
Google



Male head

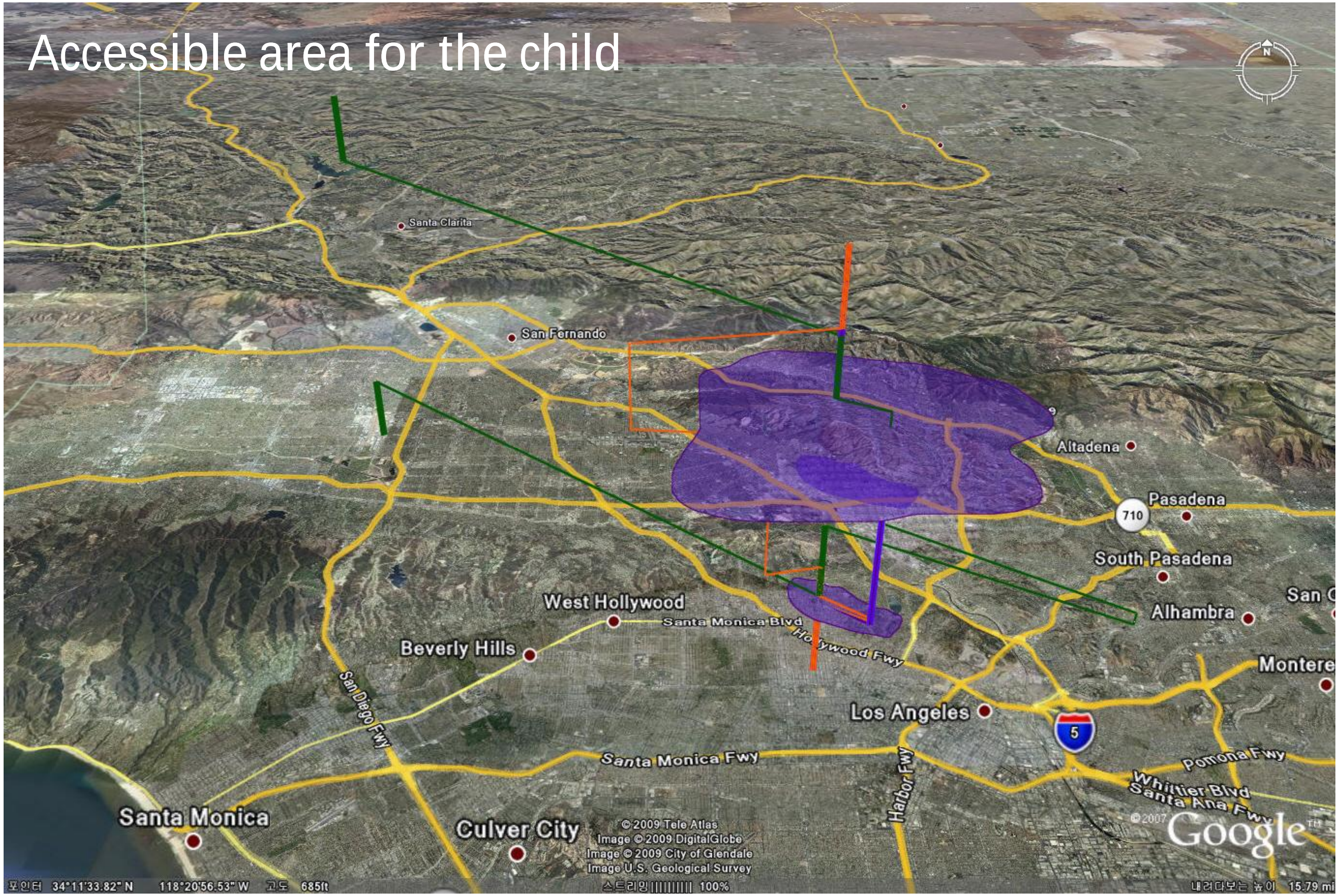
Female head

Child



Male head Female head Child

Accessible area for the child



Male head Female head Child

What is Different Today? (part 1) (I claim largely because of Ryuichi)

- We “chain” activities with patterns and sequences
  - We think of time use/time allocation instead of trips
  - We create models that allocate activity durations and timing among persons in a social network (mostly household)
- We synthetically generate whatever we are not given by external sources
  - We recreate the life of individuals using a combination of data and techniques
- The spatio-temporal multidimensional continuum is the natural canvass of building models
  - GIS and complex computation is routine
- Trip chaining (tours) and passenger serving is common practice among many applications
- We insist for practice to change and when it does not we jump in to change it ourselves

What is Different Today? (part 2)

- We are more confident we can deliver “a better model”
- We have stronger technology
- We have more but equally dirty and still cross-sectional data
- We have 20 years of experience making mistakes and getting it right (sort)
- We also have an entire generation of trained professionals in dynamics, econometrics, time-use and so forth
- Practitioners are ready and they are listening
- Legislative initiatives are supporting our agenda (SB375)
- Our duty is to deliver better models!

AND WE WILL DO THAT

Thank you very much
Domo Arigato