Assistive Dining Technology 1970 through 2005

Report Compiled by:
Mealtime Partners, Inc.
1137 S. E. Parkway
Azle, TX 76020

Assistive Dining Technology
1970 through 2005

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Survey of Assistive Dining Technology
1970 through 2005

Preface

This document was prepared by Mealtime Partners, Inc., the developer of the Assistive Dining Device. As the developer of assistive technology for eating, we consider it our responsibility to maintain cognizance of all related activity to ensure that our products are always the best possible and are consistent with state-of-the-art technology. Although the document is primarily for internal use, we occasionally are willing to share the information with others when it may assist them in making wise selection decisions for themselves or the individuals for which they provide care.

This document was originally created in 1995 to assist in deciding whether to continue the development of the assistive dining device technology that was originated at The Arc in the late 1980's. At that time it became apparent that there were no devices that met the needs of most individuals who cannot self-feed, and the decision was for Mealtime Partners to continue developing assistive dining technology. The result is the self-contained, portable Assistive Dining Device Model 1 described as one of the devices in this document. This report has been updated several times, most recently, in late 2005. At this time, we still believe that the Assistive Dining Device is by far the best assistive technology for eating for those who require complete assistance in eating.

The remainder of this document contains a description of each of the commercially available dining devices and research projects along with a brief description of the device operation based on the information provided by manufacturers, suppliers, and developers. No devices were acquired or studied in operation, which would provide a more comprehensive evaluation. Also, except in this Preface and in the description of the Model 1, Mealtime Partners has not inserted any personal opinions about the accuracy of the information that was provided by the manufacturers and developers, including personal knowledge we have gained about these devices. We have passed along the information unedited, as best possible.

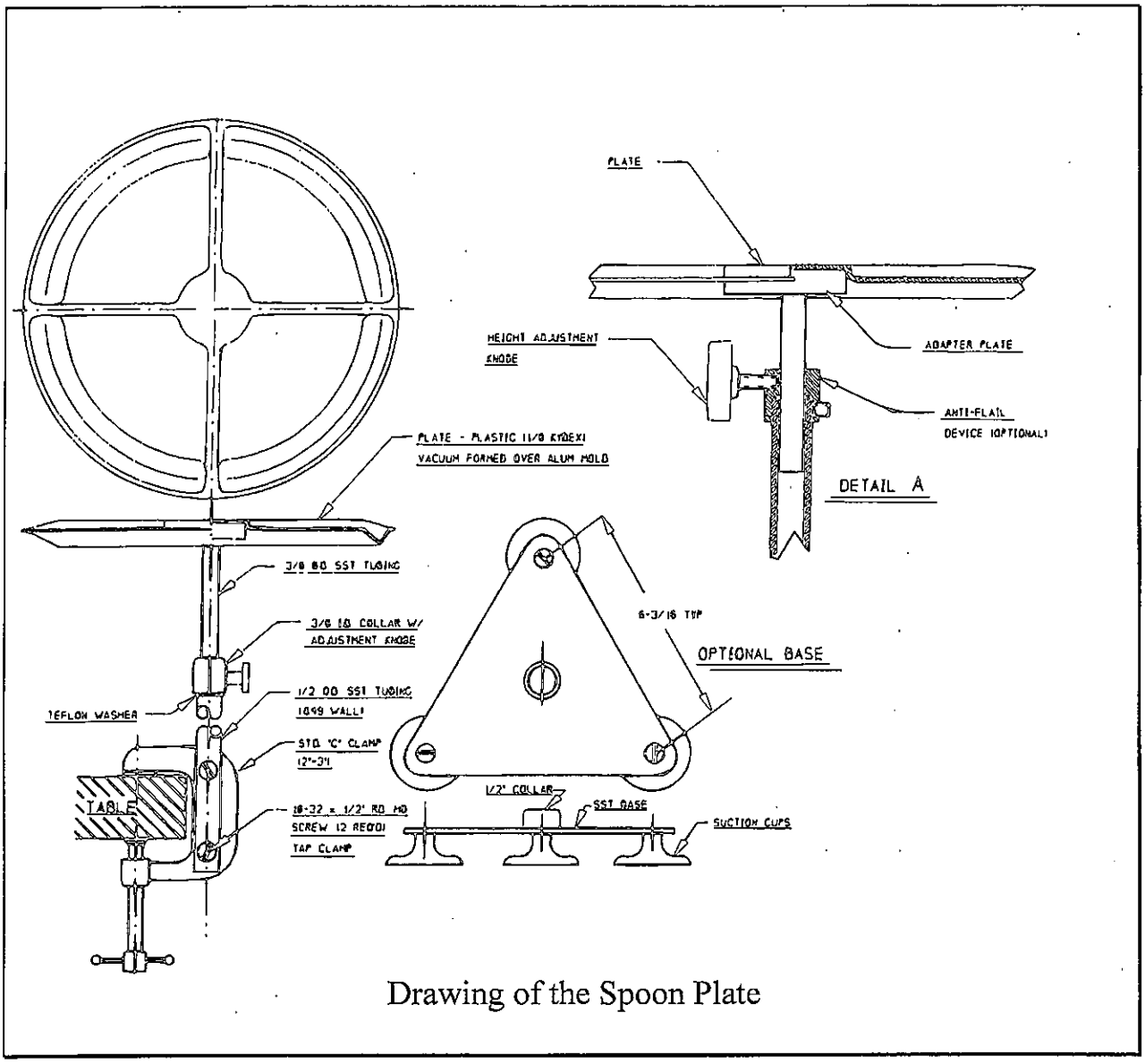
Introduction

There are 7 dining devices that are commercially available in the United States (4 powered and 3 manual) and three powered devices available in other countries. Additionally, related research is being, or has been, performed in several areas. The devices and research projects and their current status are summarized in the following tables and document.

DEVICE NAME	PRICE	CURRENT STATUS
The Spoon Plate/Spin-a-plate	N/A	Constructed by clinicians as needed
Powered Dining Devices		
Mila One-Step Feeder	$350	Available from Mila Medical Company
The Winsford Feeder	$2,995.95	Available from several sources (price varies slightly)
The Assistive Dining Device Model 1	$7,995	Available from Mealtime Partners, Inc.
The Neater Eater Electric Model	$3,795.95	Available from Sammons Preston Rolyan Catalog
The Handy One	£3,950 (in 2000)	Available from Rehab Robotics Ltd. ***(only sold in the UK)***.
My Spoon	$3,200	Available from SECOM Co. Ltd. ***(only sold in Japan)***
The Assistive Robotic Arm, ARM (formally called MANUS)	$25,000	Exact Dynamics, Heerenberg, The Netherlands
Manual Dining Devices		
The Neater Eater Manual Model	$2,695.95	Available from Sammons Preston Rolyan Catalog (arm stabilizing device)
The Comfy Feeder	$510.95	Available from Sammons Preston Rolyan Catalog (arm stabilizing device)
Stable Slide Self-Feeder Support	$324.95	Available from Sammons Preston Rolyan Catalog (arm stabilizing device)
Discontinued Devices		
The Eatery		No longer being manufactured
Cerebral Palsy Feeder	-	No longer being manufactured
The Baco Feeder CP3-C	-	No longer being manufactured
The Beesen Automaddak®	-	No longer being manufactured
The Winsford Feeder Model 4	-	No longer being manufactured

RESEARCH PROJECTS	CURRENT STATUS
Helping Hands Monkey Helpers	Helping Hands: Monkey Helpers for the Disabled, Boston, MA
The Arlyn Feederbot	Arlyn ToolWorks, Carlisle, PA
ISAC Humanoid Robot	Center for Intelligent Systems, Vanderbilt University, Nashville, TN.
The Robotic Appliance	Research concept developed by Advanced Robotics Technology Systems, Pisa, Italy.
Discontinued Research Projects	
The DeVAR Research Project	This project evolved into the ProVAR Vocational Workstation. It no longer addresses eating.

The Spoon Plate



Drawing of the Spoon Plate

Information updated December 2005.

Fabrication information available from:

Jack Greenfield C.O.
Los Amigos Research & Education, Inc.
of Rancho Los Amigos Medical Center, Orthotics Dept.
7450 Leeds Street
Downey, CA 90242

Telephone: (310) 940-7655

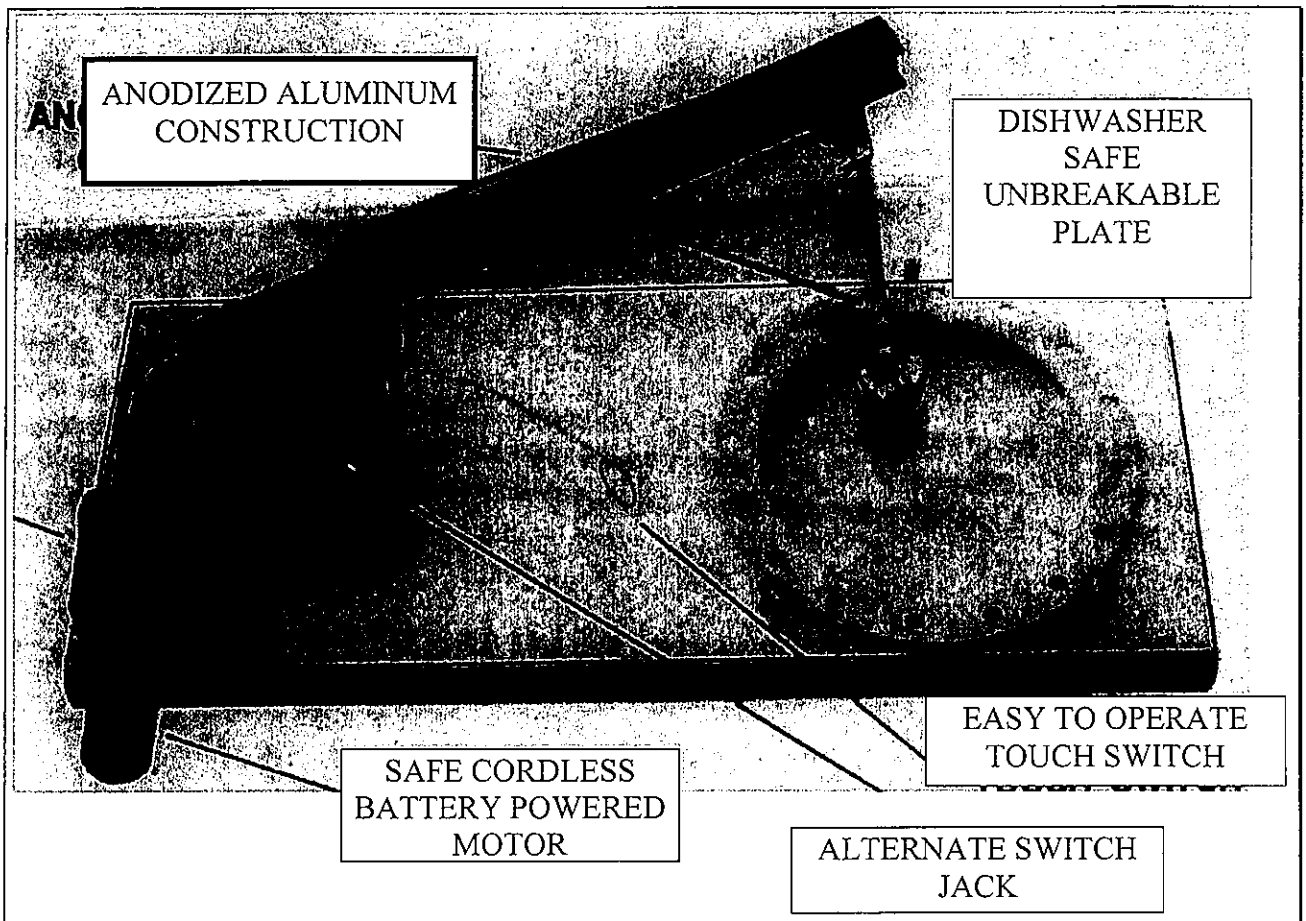
Operation: The Spoon Plate and Spin-a-Plate are similar devices which are assembled by clinicians. The diagram above illustrates the Spoon Plate. The Spoon Plate is a portable device that can be adjusted to the level of the users mouth when set up on table surfaces of varied heights. The plate is 10 inches in diameter and is made of Kydex.® This material has the advantage of being able to withstand the intense heat of institutional dishwashers, a requirement for use by patients in a residential care setting. The Kydex is formed on a mold that has a rim bowled to the approximate depth and length of a spoon. Small ridges divide the plate into four sections to separate different types of food. The plate is set on a telescoping rod. By using a collar with a setscrew to prevent slipping, the height of the rod can be adjusted to rest at the level of the users mouth when the height of the table varies. The user must lean forward and remove food from the plate with their mouth. The plate can rotate for food selection. The Spin-a-Plate operates on the same principle using a pie pan or plate inverted over a dinner plate. This allows food to be placed in the grove between the two dishes.

User requirements: There are three parameters to consider when determining whether a user is a candidate for use of the Spoon Plate. There must be some degree of jaw, lip and tongue control in order to take food from the rim of the plate. The user must have sufficient motion and control of their head and trunk to reach the plate and then to withdraw from it in order to chew. Minimal lateral movements are also needed to rotate the plate. Since this method of self-feeding in novel and the appearance of the device is unusual, a desire to achieve some measure of independence in self-feeding is a prerequisite. Self-motivation will enable persistence during practice and advocacy when instructing others who will set up the device at mealtime.

Other: The Spoon Plate was designed by Elizabeth Wyckoff, OTR and Margaret Mitani, OTR. The originally concept was developed in Denmark by Karen Rygaard, O.T. Darrel Clark, C.O. and Robert Duer at the Orthotics Department of Ranch Los Amigos Medical Center designed and fabricated the permanent device from a prototype developed by Wyckoff and Mitari. A sandwich holder and beverage holder complete the set-up. The diagram shows a spoon plate and two types of bases. The 'C' clamp allows the plate to be mounted on the side of a table. The triangular base has suction cups so it may be secured to the tabletop.

Comments: Individuals with cerebral palsy, high spinal cord injury, and arthrogryposis use this device. Preferred for home or school use. The device can be home made. The device is not used as frequently as it was a decade ago.

The Mila *One-Step* Electrical Feeder



Picture of the Mila *One-Step* Electrical Feeder

Information updated December 2005.

Distributor: Mila Medical Company, 11554 Encino Avenue Grenada Hills, CA 91367 Telephone: (818) 363-1908.

Price: $300, including battery charger.

Operation: One switch operation. Activated by head or other parts of body to scoop food and automatically rotate the plate. A stainless steel wire chin switch is provided and can be bent into position. A jack for connecting an

alternate switch is also available. The user has complete control and can eat at his/her own pace.

User requirements: Not specified.

Other: Battery operated. Dimensions and weight not provided in the literature.

Comments: This is the least expensive mechanical assistive dining equipment that was located in 2005, priced at only $300. It has an arm with a spoon attached. The plate is dishwasher safe and has holes around the perimeter. A small rod connected to the arm fits into the holes in the plate and causes the plate to rotate. The rod may need to be bent into position periodically to assure proper alignment. The spoon is metal and is not removable (without a screwdriver) for cleaning and must be cleaned with a damp cloth or sponge. The spoon must be bent to be positioned appropriately for feeding. All moving parts need to be lubricated with a light machine oil (WD-40) or sewing machine oil. The distributor will provide loaners upon request. It has a one-year unconditional guarantee.

The Winsford Feeder

The Information updated in December 2005.

Manufacturer & Distributor: North Coast Medical, Inc.
18305 Sutter Blvd, Morgan Hills, CA 95037-9946

Telephone: (800) 821-9319 Fax: (877) 213-9300

Distributor: Sammons Preston Rolyan., PO Box 32, Brookfield, IL
Telephone: (800) 323-5547 or FAX: (800) 547-4333

North Coast Medical Suggested retail price: $2,995
Sammons Preston Rolyan Pricing: $3,745

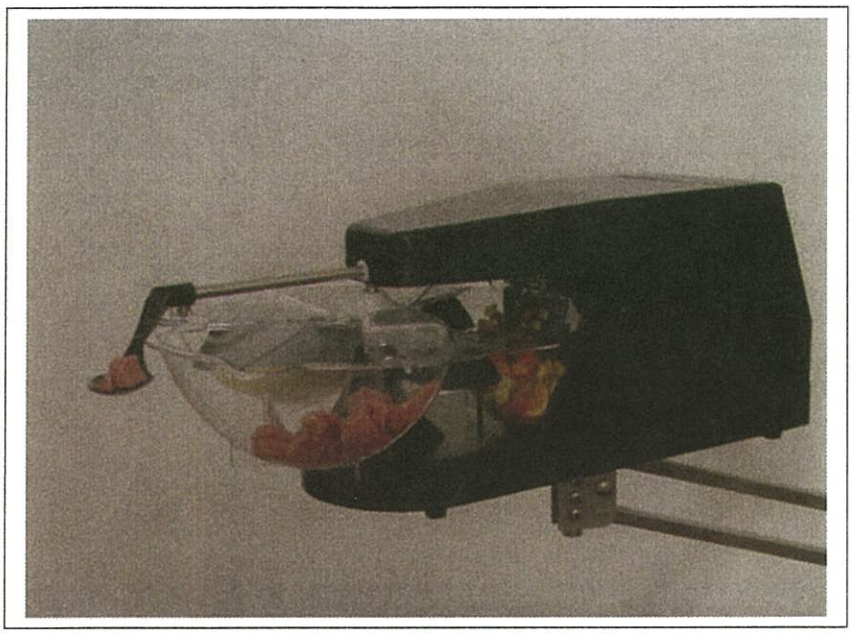
Operation: Two control functions are required. One control rotates the plate to position the food adjacent to the pusher. The other control pushes the food onto the spoon and raises the spoon to mouth level. The user must lean forward slightly to remove the food. A second activation of that control lowers the spoon back to the plate. A single dual-control chin switch is utilized to accomplish these functions and comes standard with the Winsford Feeder. A hand/foot switch that can be used to replace the standard chin switch also comes with the Winsford.

User requirements: It is designed for those who are able to sit in an upright position at a table to eat.

Other: The Winsford Feeder consists of a 12 inch by 18 inch base with an arm, a food pusher, and a glass holder attached. The height of the base is adjustable. The Winsford requires a minimum height of 10 inches from the surface on which it rests to the users mouth level. The plate sits between 3 rollers on the base to hold it in place and to rotate it. It utilizes a Corning "Corelle"® dinner size plate (available at local stores) and a spoon is provided with the Winsford. The spoon mount is flexible so the user can move their head when the spoon is in their mouth. To eat soup or cereal, the pusher and dinner plate must be removed and a turntable, shelf, bowl and drip pan installed. The weight is 18 lbs. and it uses 2 motors and operates on a 6-volt battery which requires one overnight recharge each week. A carrying case comes with the device.

Comment: In previous surveys of dining technology there have been two Winsford Feeders reported, the Models 4 and 5. Currently only one model is produced and the name has been abbreviated to simply the Winsford Feeder.

The Assistive Dining Device Model 1



Information updated in December 2005.

Manufacturer and Distributor: Mealtime Partners, Inc., 1137 S. E. Parkway, Azle, TX 76020
Phone: (817) 237-9991/ Fax: (817) 237-0102

Suggested Retail Price: $7,995.00

Operation: The Assistive Dining Device (ADD) is a piece of equipment that allows people to feed themselves without using their arms or hands. Food is placed in the three bowls that come with the dining device. The bowls rotate until the desired food is located under the spoon. The spoon then dips into the bowl, scoops up the food, and presents a rounded spoonful of food very near the lips of the user. The user must lean forward slightly and to remove the food from the spoon, which requires a small amount of neck movement. A small amount of upper torso movement makes the device easier to access but is not essential.

The Assistive Dining Device consists of a food serving unit and a support arm. The support arm is adjustable and can position the device in front of the user within a 18 inch diameter vertically or horizontally. This range of positioning permits the device to be located appropriately to meet a variety of users needs.

The food-serving unit supports three bowls and contains the electronics, motors, and battery to turn the bowls and manipulate the spoon. The dining device will serve three full meals and three snacks before requiring recharging overnight (4.5 hours maximum).

Each bowl is clear and is designed to serve 0.24 liters (one cup) of food. The depth and shape of the bowl, along with the use of the appropriate bowl cover, provide the proper placement of food on the spoon as it scoops. The inner shape of the bowl matches the path of the spoon as it rotates through the bowl. The bowl should not be filled with more than one cup of food. Doing so interferes with developing a well-rounded spoonful of food.

The ADD is positioned on the mounting arm in front and slightly to the side of the user. The bowl position and transparent design permit the user to easily view the contents of the bowl during the meal so that they will know what food selections are being offered. The offset positioning also permits the user to see around the ADD to allow functioning in the normal mealtime social setting.

The dining device serves a wide variety of commonly accepted table foods that are normally eaten with a spoon or fork. Peas, mashed potatoes, breakfast cereal, pudding, fruit cocktail, coleslaw, etc. Larger foods like meats, sandwiches, pizza, cookies, salads etc. require cutting into bite size portions so that the spoon can get under and lift them from the bowl. Liquids can be served but may have an occasional drip. The bowls are designed to accommodate normal hot or cold foods and are both dishwasher and microwave oven safe.

The Assistive Dining Device provides an extremely wide range of functionality. This allows the device to meet the functional/cognitive needs of a diverse range of users, and, as a user becomes more proficient, permits the ADD functions to be adjusted accordingly. There are numerous combinations of bowl rotation movements and pause times, user switch minimum and maximum dwell times and pause times between switch activation's and time settings for spoon retraction after user contact. All of these can be adjusted from the control panel located on the feeding head.

Three general modes of operation are available. Moving from lower to higher user capabilities, the three modes for operating the dining device are: fully automatic; using one adaptive switch; and, using two adaptive switches. The automatic mode of operation provides for the person whom either cognitively and/or functionally cannot use an adaptive switch. The dining device bowl rotates to a food selection and the spoon presents the food to the user. If spoon contact is not detected (the user does not touch the spoon), the food is returned to the bowl it came from, the bowls rotate to the next food selection, and the spoon presents that food to the user. This pattern is continued until the food is taken from the spoon. Once the spoon is touched the dining device continues to automatically present that food selection until spoon contact ceases. It then moves to the next bowl and restarts the food presentation described above.

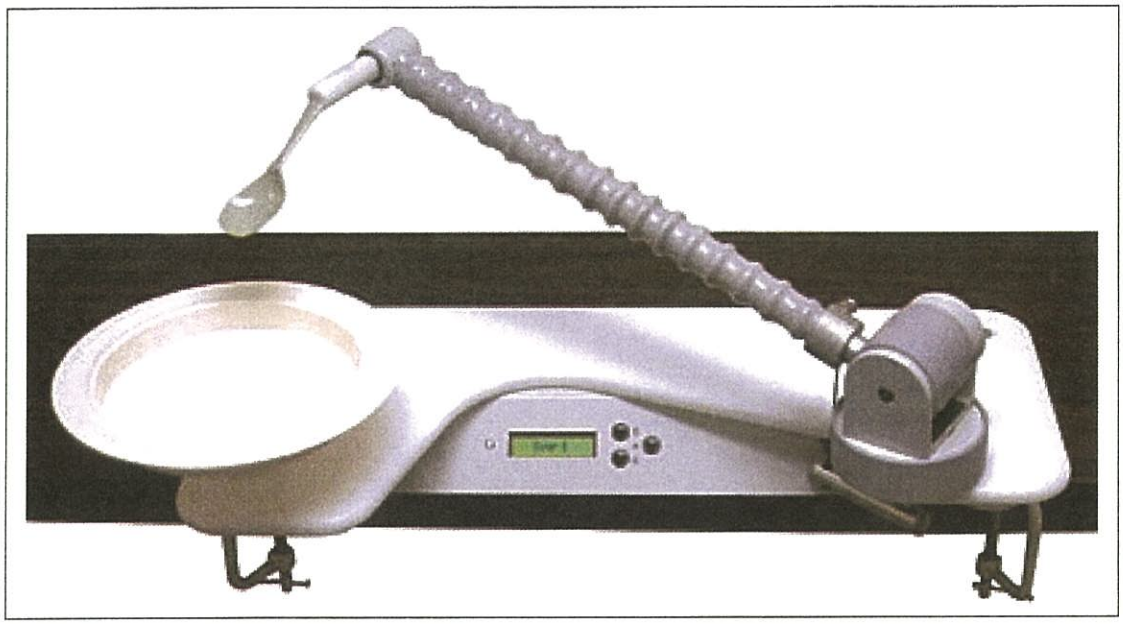
Using one adaptive switch, the user depresses the adaptive switch to begin food selection. In this mode, the bowl rotates from bowl to bowl pausing briefly for each food selection. When the desired food is under the spoon depressing the switch will stop the bowl and initiate the spoon action. The spoon will then continue serving food from the designated bowl until the switch is depressed again. After the switch is depressed again, the spoon will retract and the bowl will once again rotate from bowl to bowl. If the spoon remains untouched by the user for a specified period, the spoon will automatically return the food to the bowl it came from and the bowls will resume rotating. This mode of operation requires a minimal physical effort for the user, while providing faster access to the food of choice than gained through the automatic mode. However, it is less fatiguing for some users than using two switches.

The two-switch mode of operation permits the user with the greater physical and/or cognitive abilities to control the device using two switches. One switch controls food selection allowing the user to move rapidly from bowl to bowl, while the second switch controls the spoon movement. Using two adaptive switches provides the user with the greatest control of the ADD and provides the quickest food access.

The dining device is ready to use straight from the box. However, as mentioned earlier, all of the timing can be altered to suit the user's preferences using the control panel.

User Requirements: User must be in an upright enough position to take food from the spoon. They must have 1 1/2 inch forward head movement (to enable them to remove food from the spoon). The user can eat from the dining device while sitting in a wheelchair, a regular chair, a high chair (young children), or in a standing frame, or in bed.

The Neater Eater Electric Model



The Information updated in December 2005.

Distributors: Sammons Preston Rolyan., PO Box 32, Brookfield, IL
Telephone: (800) 323-5547 or FAX: (800) 547-4333

Suggested retail price: $3,795.95

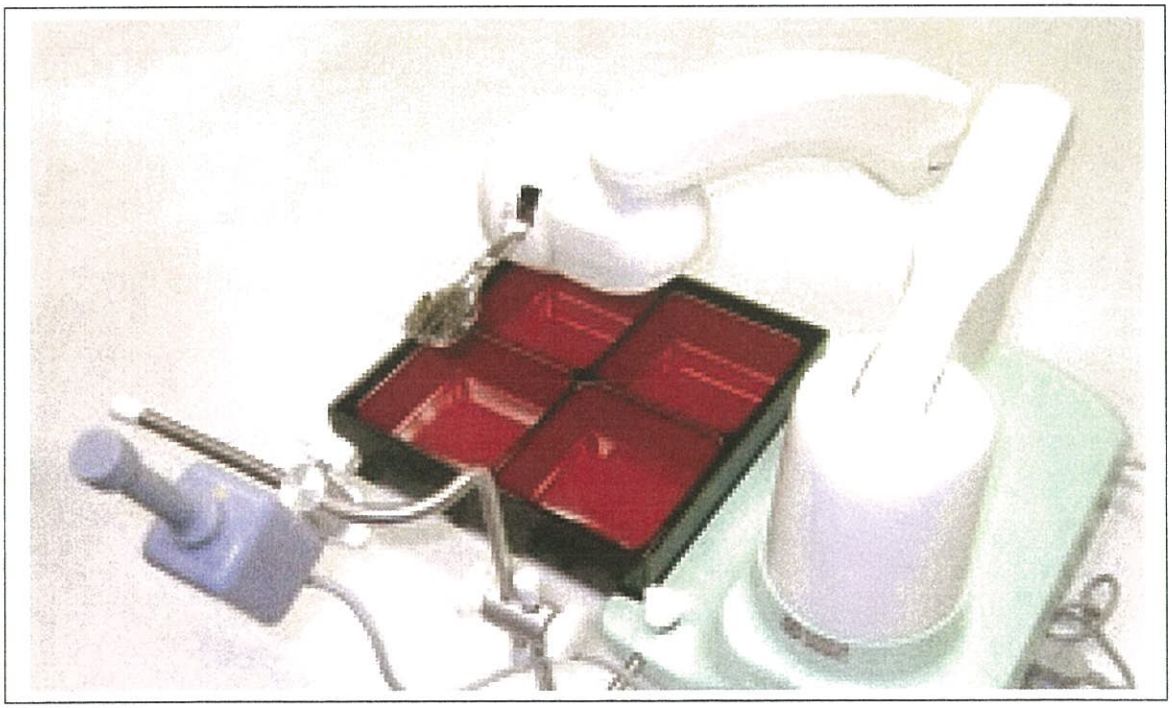
Operation: The Neater Eater Electric Model is an electric dining device that can be programmed to serve food, soup, or a sandwich. It can be programmed to feed five individual patients of varying heights and positions. A software program teaches the device the mouth position, the chew and swallow cycle, and how to respond to switch commands. A plug-in joystick and switches set up the positions that can then be locked off from changes until reprogramming is needed. The arm that brings the self-leveling spoon up and forward is spring-loaded so it will not keep going if it hits the face. Pause times can vary from 1/10 second to ten seconds and can be set at the mouth, at the plate, or at a pause position. Switching options vary from a single switch that turns the plate and cycles to the mouth to wait for another plate motion to two switches that allow the patient to enjoy a quality meal every time. There is even a cycle that sends the spoon back to the plate if it came up empty. The unit comes with two spoons, two plates, a plate stand, a sandwich holder, two switches, and adjustment wrenches. The instruction

manual is designed for the caregiver, and technical support is available to help you select the best switching and operating options for your client.

User requirements: It is designed for those who are able to sit in an upright position at a table to eat.

Comments: The Neater Eater is manufactured in the United Kingdom and distributed through the Sammons Preston Rolyan Catalog. It has evolved from a manual device that was designed to assist people with tremors to eat independently (the manual Neater Eater, described later in this document).

My Spoon



Information Update December 2005.

Distributor: SECOM Co. Ltd. 1-5-1 Jingumae, Shibuya, Tokyo 150-0001 Japan.

Suggested Retail Price: $3,200 (only sold in Japan)

Operation: My Spoon has been developed by SECOM Co. Ltd. The research and development was partially funded by the Association of Technical Aids. It is a Meal-Assistance Robot. The device sits on a table for the user to eat from it.

It is comprised of a base unit that holds 4 square bowls to which the robotic arm is attached. It is controlled by either a joystick or adaptive switch. It has 3 modes of operation: The Manual Mode; The Semi-automatic Mode; and, the Automatic Mode.

In the Manual Mode the user has the maximum flexibility and control by fully controlling the spoon with the joystick. By moving the joystick in all four directions (up, down, left, right), any food item within the bowl can be eaten in any desired order. The sequence is as follows:

1. Using the joystick, select the compartment that contains the desired food.
2. After the spoon reaches the compartment, use the joystick to fine-tune its position near the food item.
3. After the spoon is in place, instruct the spoon to grasp the food by using the joystick.
4. The spoon will grasp the item and automatically approach the mouth. When the mouth comes in contact with the spoon, the fork will automatically retract.

The Semi-automatic Mode offers simplified user operation, however a specific food item cannot be selected. After selecting the desired compartment My Spoon will automatically grasp a food item in the compartment and approach the users mouth.

The Automatic Mode allows the device to be controlled by pressing an adaptive switch. My Spoon will automatically select a compartment, grasp a food item and carry it to the mouth when the switch is pressed.

Other: My Spoon requires AC100V (50/60Hz) to operate. Its base measures approximately 11"x 14.5"x10" and it weighs 13.2 pounds without attachments.

SECOM Co. Ltd., recommends that individuals with the following problems do not use My Spoon:

- Problems with chewing and/or swallowing.
- Motor control problems such as moving their head towards the spoon, operating a joystick or pressing a button.

- Problems maintaining upright posture (more than 60 degrees from horizontal) for an extended amount of time, even with the use of a belt or other mechanism to help maintain posture.
- Problems seeing the My Spoon arm.
- Problems understanding how to operate My Spoon.

Other: The company is currently working on developing image processing technology to facilitate more reliable food location within the container that, in turn, will allow for more reliable food pickup.

The Assistive Robotic Manipulator, ARM

Information Updated December 2005.

Distributor: Exact Dynamics, Grensstraat 7, NL-7041 GZ, 's- Heerenberg, The Netherlands
Phone: +31 (0) 316 334 114 Fax: +31 (0) 316 331 327

Suggested Retail Price: $25,000

User Requirements: Criteria for using the ARM are:

- Is able to operate some kind of input device like a keypad, joystick, head control, switch, etc.
- Have sufficient learning capacity to understand the device.

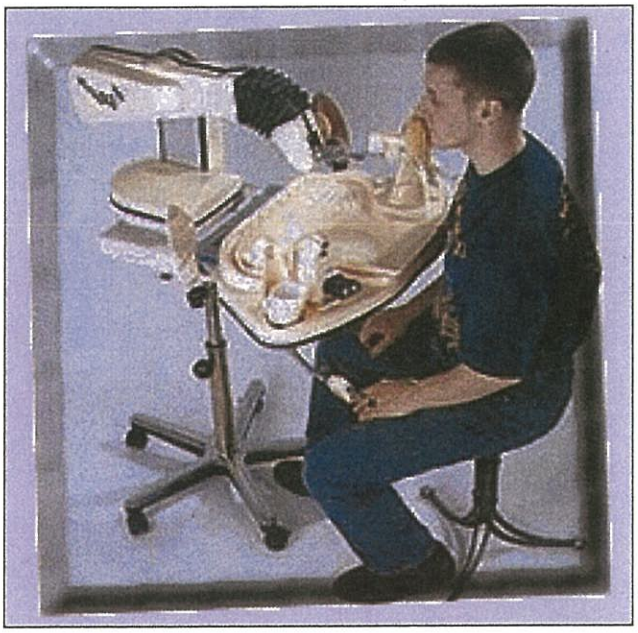
- Is highly motivated to use (technical) aids in order to reach the goals.
- Wants to be independent and has a strong drive to explore the possibilities of the ARM.
- Uses a stable electrical wheelchair.
- Have sufficient visual capabilities.

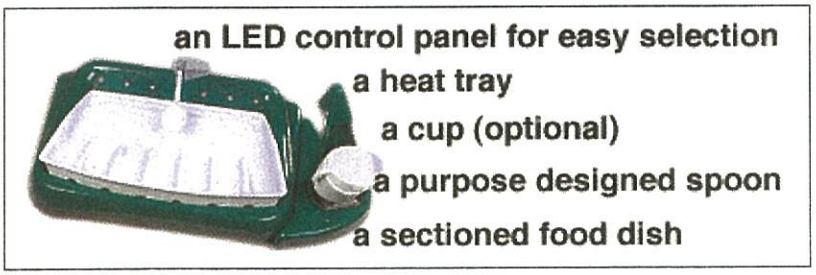
Operation: The Assistive Robot service Manipulator (or ARM for short), is also known as Manas. It is a 6+2 degree-of-freedom (DOF) robot that assists disabled people with severe handicaps in their upper limbs. It compensates their lost arm and hand function. It can be mounted on an electric wheelchair (or mobile base) and allows numerous daily activity tasks to be carried out in the home, work, and outdoors. By means of an input device like a keypad (4X4 buttons), a joystick (e.g., of the wheelchair) or another device attached to a non-disabled body part, the manipulator can be operated to grasp objects with its gripper. When not in use the ARM can be conveniently folded in beside the wheelchair. Worldwide user studies have shown the immense benefits of the ARM for its users. They become more self-supportive and increase their participation in society. Therefore the quality of life increases significantly. As many daily living tasks can be carried out independently, costs can be saved on professional nursing assistance. As a result the return-on-investment (ROI) of the ARM is just one to two years.

The ARM has been developed to carry out tasks such as: eating and drinking; preparing meals; taking medicine; scratching an itch; shaving; tooth brushing; housekeeping; etc.

Comment: Exact Dynamics is planning to reduce the price of The Arm in the next year.

The Handy 1





Information updated December 2005.

Distributor: Manufacturing, marketing and after sales service:
Rehab Robotics Ltd. Stafford University,
School of Art and Design, College Road, Stoke-on-Trent,
Staffordshire ST4 2XN, England.
Telephone: 44-1782-294477 / Fax: 44-1782-294414

Price: £3,950 (only available in the United Kingdom, *2000 was the last time pricing information was available*)

User requirements: Must have the ability to understand the scanning LED sequence and respond quickly enough to make selection. (LED sequence rate not in literature.)

Other: The Handy 1 was developed by the Computer Applications to Special Education Unit at Keele University in the United Kingdom. It was designed by applying microprocessor control to an existing robotic arm. The Handy 1 is a freestanding device, which can be wheeled into position in front of the user and then moved out of the way after a meal. The height can be adjusted, as necessary.

It is comprised of a microcomputer, a robotic arm, a rectangular serving plate with an LED strip imbedded in it (see illustration), troughs for food placement, and a user switch. The Handy 1 works best with foods that cohere well, like a mixture of meat and mashed potatoes or small pieces of meat with vegetables in a thick gravy sauce. It deals poorly with nuts, chips and other foods that offer little resistance. It cannot serve soup. The robot is five-axis and weighs 15 kg, with a 500-gram lifting capacity. The Handy I is not readily portable, even though it can be easily moved away from the user when not in use. The Handy 1 is designed to look attractive, and be effective and easy to use, even by the most severely disabled person.

The human machine interface is a purpose designed single switch, called a 'Handy Wobble Switch'. This interface is the only part of the system that may differ from client to client. Handy 1 in its standard form, comes with a 'Handy Wobble Switch' fitted to its casing via a length of flexible gooseneck tubing. In this form, any individual using their hands, arms, or lower body can operate the robot. If need be the gooseneck can be removed from the robot and positioned on to the wheelchair for upper body and head movement.

In most cases this switching arrangement has proved successful, allowing a wide range of different disability groups to operate the system easily. However, for people so disabled that even the smallest physical movement required to operate the wobble switch is not possible, then switches are available from the manufacturer that can be operated by the blink of an eye, thus enabling most people access to the equipment.

Users are able to make a choice of what food they want to pick up and bring to their mouths by means of a scanning LED indicator strip, which is designed as an integral part of the tray section of the robot.

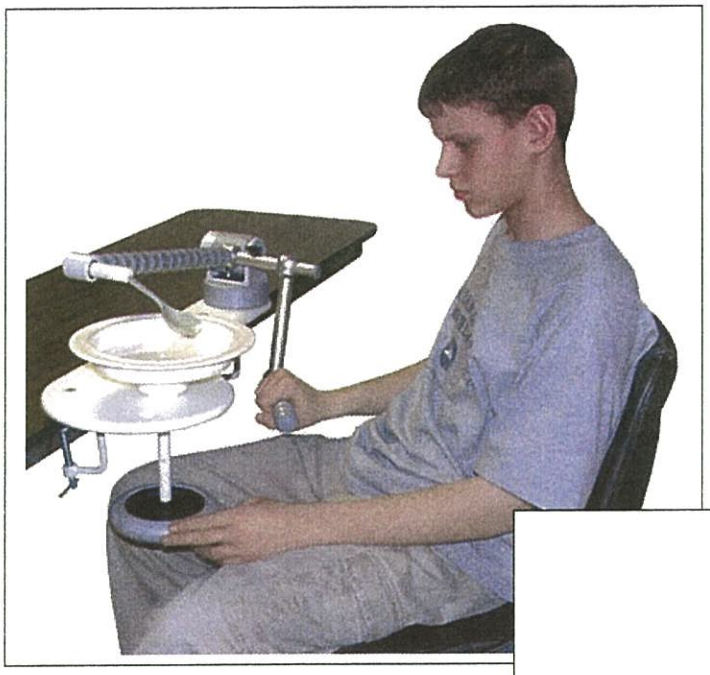
Handy 1 allows a maximum of seven different types of food to be placed on to the dish for selection by the user. The pace at which the meal is taken is under the direct control of the disabled operator. Many users of Handy 1 have commented that the robot is more patient with them than a human caregiver, allowing them time to enjoy their meal.

The choice of food is placed onto the walled sectioned dish, which is supplied with the system; if a hot meal is to be served, a heated element can be switched on to keep the food at an even temperature.

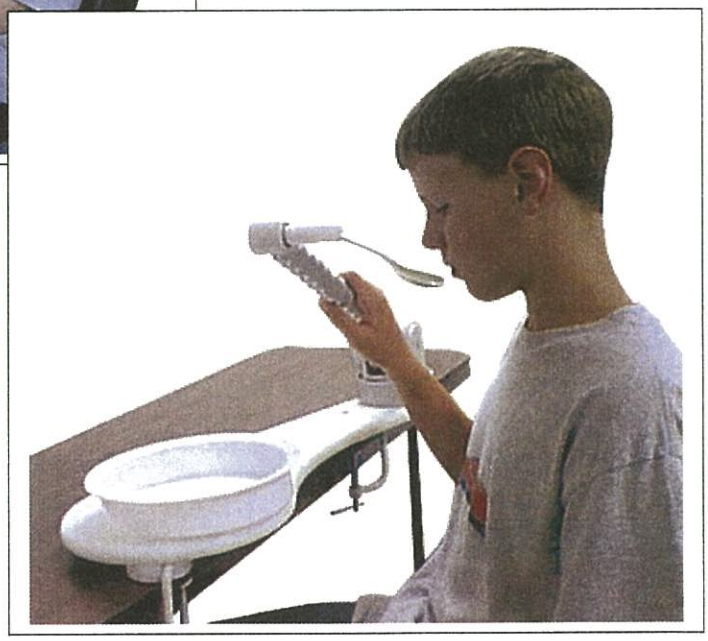
Once the system is powered up, the LED indicator strip behind the dish begins to scan from left to right along the length of the dish. To make a choice, the user waits for the light to be illuminated behind the section of food they want to eat; they then activate their single switch and the robot proceeds onto the dish, scoops up a spoonful of that food and brings it back to a pre-set comfortable mouth position. At this point, the user then takes the food from the spoon; the next press of the switch removes the spoon to a rest position and the LED's continue to scan, to again allow for a full choice to be selected from the dish. The robot's onboard computer logs where the spoon has been to on the dish and will not allow the system to return to an area where food has already been removed.

Comments: Rehab Robotics Ltd., have modified the existing mealtime aid to facilitate washing, teeth cleaning, shaving, putting make-up on, and art. No pricing or product availability was found in 2005.

The Neater Eater Adapted Model & Manual Models



The Neater Eater Adapted Model (Left & Right Hand Models)



Neater Eater Manual Model

The Information updated in December 2005.

Distributors: Sammons Preston Rolyan., PO Box 32, Brookfield, IL
Telephone: (800) 323-5547 or FAX: (800) 547-4333

Suggested retail price – Adapted Model: $2,695.95

Suggested retail price – Manual Model: $2,149.95

Manual Model Operation: The feeding device fastens to the table and smoothly brings food from the plate to your mouth. Turn the plate to the food you want and grasp the arm to go back for the next bite. The caregiver adjusts for spoon height and forward position.

Adapted Model Operation: Includes all of the features of the manual model plus two items for those who are unable to reach up to the arm. Four-piece lever with adjustable linkage drops down to the lap level so a minimum of motion is needed to bring the spoon from the plate to the mouth.

User Requirements: Designed for those who can sit upright at a table to eat and can use their arms.

Other: Adjustable springs assist in bringing the spoon up, and forward. Comes with two spoons, two plates, a plate stand, adjustment wrenches and instructions.

Stable Slide Self-Feeding Support

The Information updated in December 2005.

Distributors: Sammons Preston Rolyan., PO Box 32, Brookfield, IL
Telephone: (800) 323-5547 or FAX: (800) 547-4333

Suggested retail price: $324.95

Operation: Smoothly glides the arm while moving from the plate to the user's mouth. The device supports the forearm as the user gathers food onto the utensil, then with a simple sliding motion, moves the wrist into the smaller top section giving stability and support while bringing food to the mouth.

User Requirements: Must have functional use of the arm/hand and be able to sit in an upright position at a table to eat.

Other: Includes a roof attachment that can be used to help keep the arm on the slide and provide additional control and support.

Comfy™ Feeder

The Information updated in December 2005.

Distributors: Sammons Preston Rolyan, PO Box 32, Brookfield, IL
Telephone: (800) 323-5547 or FAX: (800) 547-4333

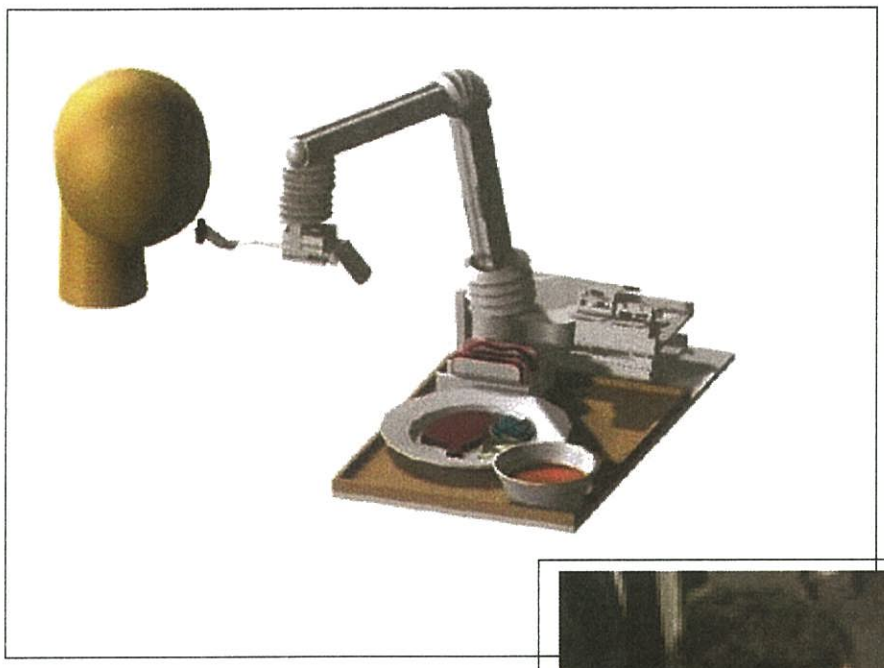
Suggested retail price: $510.95

Operation: This device was designed to help individuals feed themselves by having them guide the attached spoon through a food pick-up sequence. The self-leveling, removable-spoon, ensures horizontal positioning from the bowl/dish to the mouth eliminating messy spills. The spoon and pivot assembly can be attached to operate either in, or at a right angle to, the plane of the arm. The rotating platform is on a non-skid baseboard (16 inches X 9 ½ inches). The gas-spring level dampens tremors and jerky movements.

User Requirements: Must have functional use of the arm/hand and be able to sit in an upright position at a table to eat.

Other: This device can be useful to individuals with Multiple Sclerosis, Parkinson's disease, Cerebral Palsy, and other neurological conditions, and those with generalized upper extremity weakness. It requires no external power source to operate. Bowls and dishes are not included with the device.

The Arlyn Feederbot



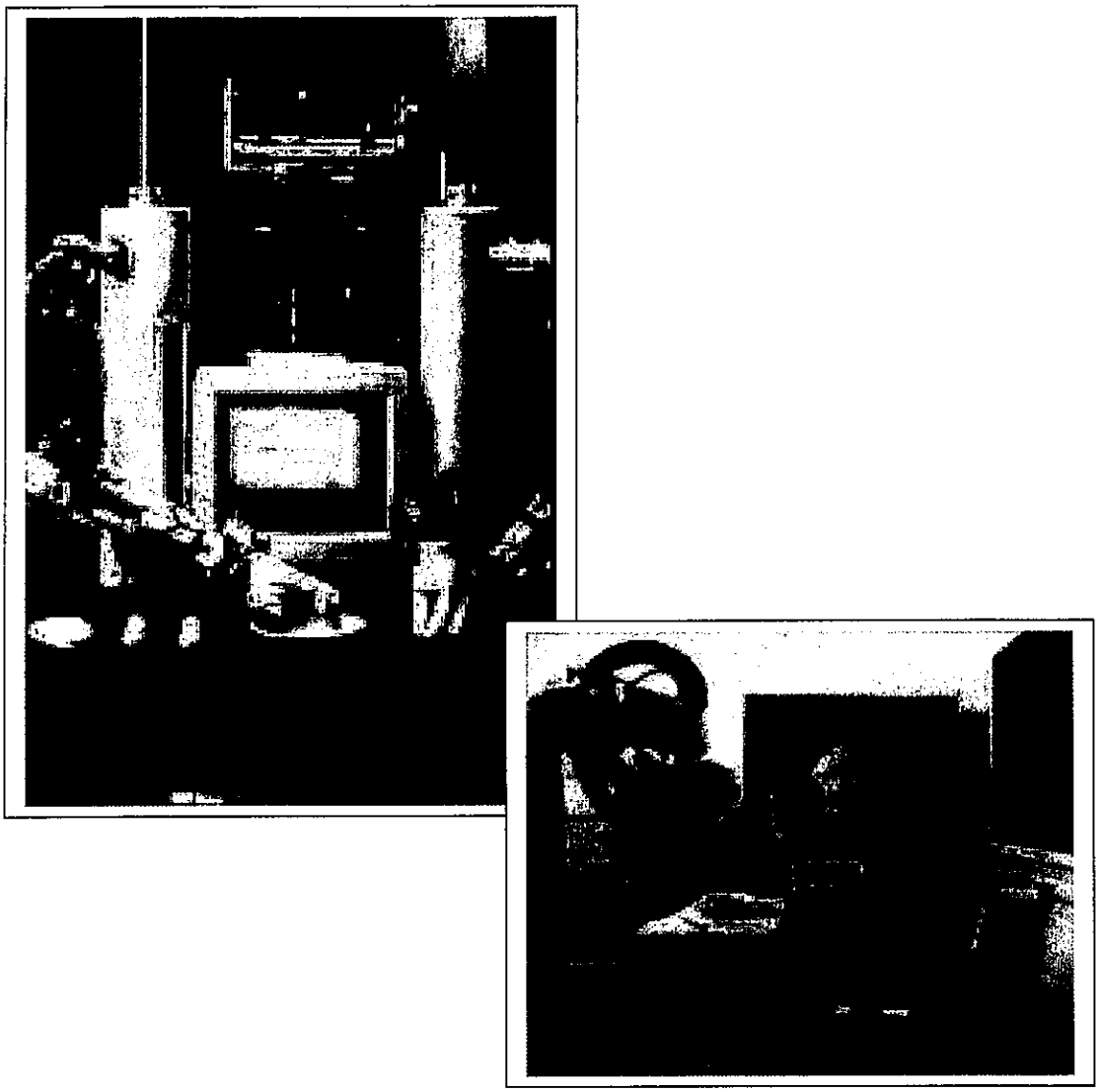
Information Updated December 2005.

Organization: Arlyn ToolWorks, 155 Shugart Road, Carlisle, PA 17013
Phone: (717) 249-7729

Project Description: This project was funded by the US Department of Education through a Phase 1, Small Business Innovation Research Grant. It was undertaken to test the possibilities of developing a sufficiently capable, inexpensive, table-top robotic self-feeding appliance. The above illustrations show a conceptual drawing and photograph of the prototype being tested. After the Phase 1 was completed the Department of Education declined to fund further research for this project.

Project Status: Arlyn ToolWorks is now adapting their robot to attach to a wheelchair for all-purpose application.

ISAC Humanoid Robot



Information Updated December 2005.

Organization: Center for Intelligent Systems
VU Box 350131 Sta B, Vanderbilt University,
Nashville, TN 37235-0131
Phone: (615) 343-0697

Project Description: ISAC is a humanoid robot that was designed and built in the Intelligent Robotics Laboratory (IRL) as a research platform for service robotics. The humanoid system also provides a test-bed to develop new technologies for human-to-

robot and robot-to-human communications, including audio, visual, and gestural methods.

Vanderbilt University is working toward intelligent service robots that can help the sick, elderly and physically challenged live independently. Researchers believe that to accomplish this aim, their robot must be task-general and able to cope with unstructured, dynamic environments such as at home. ISAC hands are equipped with multi-fingered grippers that will allow the robot to pick up a variety of objects. To pick up a spoon, for instance, ISAC employs sensitive touch sensors that help it place the spoon between a thumb and three fingers.

To deal with the complexity inherent to humanoid bodies and tasks, ISAC is designed as a multi-agent system where a separate agent is devoted to each functional area. For instance, one agent deals with arm movement, while another is devoted to interacting with humans. Using DataBase Associative Memory (DBAM), ISAC has the ability to store and structure the knowledge it acquires. To mimic long-term memory, DBAM uses a spreading activation network to form associations between database records. To efficiently structure its memories, ISAC uses a Sensory EgoSphere (SES) that processes incoming perceptual data according to spatial and temporal significance.

The humanoid system contains:

- 2 pneumatic 6DOF SoftArms actuated by McKibben artificial muscles.
- An air compressor and compressed air delivery system.
- 2 four fingered, anthropomorphic dexterous manipulators, that are called PneuHands, designed and built by the IRL.
- 2 force-torque sensors connected at the arms' wrist joints.
- A directed Perception pan-tilt platform modified in house for independent verge control of 2 color cameras.
- 2 200MHz Dula processor Pentium Pros. One controls grayscale image processing and a multi-channel audio signal processor and the other controls the 2 SoftArms with 2 arm controller boards (built in house).
- One 266 MHz Pentium-II which controls hand using in-house controller board.
- 2 dual Pentium-III with 2 color frame grabbers for primary image processing.

Project Status: Several research projects in this area are ongoing.

Helping Hands Monkey Helpers for the Disabled

Information updated December 2005.

Provider: Helping Hands: Monkey Helpers for the Disabled
541 Cambridge Street
Boston, MA 02134
Phone: 617-787-4419

Cost: No charge to the recipient

Project Description: Helping Hands: Monkey Helpers for the Disabled is a unique national non-profit 501(c)(3) organization that places specially trained capuchin monkeys (often referred to as organ grinder monkeys) with people who are paralyzed or who live with other severe mobility impairments. Helping Hands monkey helpers offer independence, hope, and companionship to individuals with severe disabilities all across the country. No fee is charged to the recipients. All costs are underwritten by donations from individual donors, foundation grants, and corporate partnerships.

As a service to the larger community, Helping Hands also conducts public education programs that teach young people how to avoid risky behaviors that can lead to spinal cord injury and how community service can be a powerful way to help others.

Helping Hands trained and placed the first monkey as a helper and a companion to a paralyzed individual in 1979. Since that time, Helping Hands has developed programs to support the lifetime needs of the monkeys and their human partners. These are the Foster Home, Training, Placement, Monkey Care, and Education

Helping Hands: Monkey Helpers for the Disabled has grown from an innovative idea into a thriving national non-profit organization that offers independence and hope to individuals with severe disabilities.

History: Helping Hands trained and placed the first monkey as a helper and a companion to a paralyzed individual in 1979. In 1982, Helping Hands became a 501(c)(3) corporation under the IRS code. From the beginning, Helping Hands' mission has been to provide assistance to people with the greatest needs: people who have become quadriplegic (paralyzed from the neck down) as a result of an accident, injury, or disease.

In the early years, Helping Hands received major developmental support from the National Science Foundation, the Veterans Administration, and from the Paralyzed Veterans of America. There was interest in investigating innovative ways to support veterans who had received severe spinal cord injuries while performing military service.

During the research and development stage, Helping Hands investigated and solidified all of the components of the program. To do this meant determining which species of monkey was best suited to the kinds of tasks the human recipients would need; how those monkeys would be obtained; how best to house them; what their dietary and medical needs would be; how to raise them; how to manage the transition process; and how to teach them their tasks. At the beginning, the various monkeys in the program were former pets or had been in other scientific programs.

Secondly, to create the parameters for recipient selection, researchers considered variables such as type of illness or injury, degree of mobility impairment, protocols for attendant care, post-injury emotional status, and physical environment.

The third major element of the research program was the development of the specialized equipment the monkey helpers would use to help a person to be as independent as possible. This included the creation of laser pointers that recipients use to direct their monkeys towards specific objects, various pieces of adaptive equipment that monkeys use to help their human partners eat and drink, and modifications that would allow the monkeys to set up telephones, television and record players, light switches, books and magazines and other objects so that the recipients would be able to use them.

Throughout the 1980s, Helping Hands continued to place monkey helpers at a steady pace. The initial research and development stage of the program officially ended in 1989, when the final review by the Veterans Administration confirmed that monkey helpers could indeed provide substantive and broad-based assistance to the target population of quadriplegic individuals, and that they were indeed cherished companions.

Beginning in 1988,Walt Disney World made an invaluable contribution to our program by developing and maintaining our breeding colony on Discovery Island in Florida. Young monkeys that had been specially bred to enter the Helping Hands program replaced donated monkeys.

A nation-wide network of foster homes was established, where volunteer families raised monkeys under Helping Hands' supervision and prepared them for the exciting transition to the training center and ultimate placement as a monkey helper. As technology changed, new tasks replaced the old (monkeys had to be taught to turn on and load computers and CD players, while the art of placing a record on a turntable passed out of the repertoire.) Training protocols were improved and solidified.

Knowledge of Helping Hands spread through the network of spinal cord injury care centers and specialty physicians, resulting in a growing backlog of people waiting to be matched with a monkey helper.

The schedule and outline of the placement week (when the placement staff and monkey travel to the recipient's home to teach them to work together) were firmly established. The staff gathered data on established partnerships, some of which were approaching 10

years in duration, and used that data to further improve training and placement techniques.

In 1994, the final government grant to Helping Hands came to an end. Helping Hands then needed to develop new connections with the public and the philanthropic community in order to continue its work.

In the later 1990s, outreach efforts and coverage in the media helped bring Helping Hands to the attention of the wider public, and donations from individuals began to replace the government funding that had ended. Grants from foundations became a major source of support for Helping Hands. Workplace giving, especially by Federal employees giving through the Combined Federal Campaign, became another avenue of support.

Placements continued, and further improvements in training methods and adaptive equipment allowed the placement of monkey helpers with people who had a wider range of mobility impairments.

Helping Hands also began to develop the informal presentations it had been conducting for school children into a formal educational presentation about the results of spinal cord injuries, and how they could be prevented. **SCIPP** (*the Spinal Cord Injury Prevention Program*) became a popular program for use in schools, summer camps, and other venues where young people gather.

In 1995, Helping Hands breeding monkeys were united with the training program in the Boston area, through a move to a new home at Southwick's Zoo in Mendon, Massachusetts. Southwick's is the largest zoo in New England and houses over 600 animals representing 120 species. This very special zoo, located in a beautiful country setting, is owned and operated by the Brewer family.

Housed in the Milton & Bernice Stern Building, the indoor/outdoor facility provides both a home for the breeding monkeys and an educational/display area. Visitors to the zoo are able to learn more about capuchins and the unique relationship these monkeys can enjoy with their human partners.

In 1999, Helping Hands undertook the search for a permanent and specially modified home for its training center. Ultimately an old building in Boston was selected and rebuilt especially for Helping Hands' needs. The Thomas and Agnes Carvel Foundation Center (also known as the Monkey College) officially opened in 2004. This purchase represented a significant investment for the program. Fundraising to underwrite the costs of construction and to name the important rooms and floors of the building continues.

Current Information: Today, Helping Hands places an increasing number of monkey helpers in new homes annually. The training and placement effort are still our primary focus of work and energy, as we strive to enlarge the number of people we help.

The Robotic Appliance

Information updated December 2005.

Organization: Advanced Robotics Technology Systems Lab, Plo Sant'Anna Valdera, Viale Rinalda Piaggio 34, 56025 Pisa, Italy

Research Centre on Rehabilitation Bioengineering of the Centro Protesi INAIL, Vigorso di Budrio, Bologna, Italy.

Project Description: This project proposes moving away from creating robots that are multipurpose with the ability to function throughout the residential environment to creating robots that are appliance-like with the ability to function as one of a localized system of assistive aids in a specific environment within the home. The advent of smaller and cheaper microprocessors and micro-technology make this idea of the affordable "robot appliance" even more attainable in the short-term than humanoid assistants.

The project goal is to design personal robotic aids that are not only affordable and commercially viable but also have universal appeal and benefit to the increasing pool of potential disable and elderly users. The project proposes the development of robot appliances that are task-specific and part of a network where they can interact with other information and robotic appliances.

Work continues on the design and development of both the feeding robot appliance and the fetch-and-carry robot appliance as well as on the implementation of the local network. Implementation of this network of aids permits the examination of challenges inherent in integrating and in controlling both robot appliances and standard appliances within one domotic network. A functional prototype of a domestic network consisting of a prototype robotic appliance for fetch-and-carry tasks and standard appliances for the kitchen environment revealed the lack of standard protocols for sharing information and for modifying on-board functions were the main barriers to implementation of the proposed system of aids.

Project Status: Next steps of the work will be the implementation and clinical validation of two different prototypes of a novel robotic feeding appliance and the realization of a second-generation prototype of the assistive system with the fetch-and-carry robot.