

**M.P.NACHIMUTHU M.JAGANATHAN ENGINEERING COLLEGE**

**NAALAIYA THIRAN – IBM PROJECT**

**IOT BASED GADGET FOR CHILD SAFETY**

**MONITORING AND NOTIFICATION**

Presented by,

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# **1. INTRODUCTION**

## **1.1 PROJECT OVERVIEW**

The main concept is to create a app that used to check the location of the child as safety system. This concept focus on finding the child and continuously update the current location to the parent or caretaker.

The IBM cloud, Node-red and IBM Watson are used to create the web-application which is to be used in IoT child safety monitoring gadget.

## **1.2 PURPOSE**

Parents can simply leave their children in park, school or somewhere else, child tracker application helps the parent to continuously monitor the child's location.

Notifications will be sent to the caretaker's mobile, according to the particular geofence around the child.

# **2. LITERATURE SURVEY**

## **2.1 EXISTING PROBLEM**

1. If the child may in the area where there is no network or move away from the network coverage area, there is a difficulties to identify and track the location of the child.

2. The wearable device may be removed by someone who try to kidnap the child.

3. If it was removed or missed by the child, the identification and tracking are worthless then we proposed the method of sense the body temperature of child to identify whether it is with the child or not.

## 2.2 REFERENCE

S.No	Title	Reference
01	Safety of a child in large public	<a href="https://ieeexplore.ieee.org/abstract/document/9031524">https://ieeexplore.ieee.org/abstract/document/9031524</a>
02	Intelligent child safety system using Machine Learning in IoT devices	<a href="https://ieeexplore.ieee.org/document/9277136">https://ieeexplore.ieee.org/document/9277136</a>
03	Smart wearable devices for little children	<a href="https://ieeexplore.ieee.org/document/7899531">https://ieeexplore.ieee.org/document/7899531</a>

## 2.3 PROBLEM STATEMENT DEFINITION

I am	Product developer	to make a device
I'm trying to	made a device	for child safety
But	will not receiving the propersignal	signal clashes
Because	out of coverage and sometechnical issue	internet issue and serverdown
Which makes me feel	Anxiety	we can't face the problemdirectly

## 3. IDEATION & PROPOSED SOLUTION

### 3.1 EMPATHY MAP CANVAS



## 3.2 IDEATION & BRAINSTORMING

2

### Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

#### MATHI

It affects the safety of the child and create the panic to parents

Issue occurring in data doesn't reach to parents

when the child's geofence not works due to humidity...

the issue will occur if the child gone over the geo fence or communication is not strong.

this can be overcome by forming Zig bee and connect the deices to zig bee.

issue occurring in location not marked or mismatched to safety location

it is important because for the child's safety

It is important because the message has to be sent to parents when child gone to danger area.

the issue is if the GPS data doesn't pushed to dashboard due to delay in satellite communication it creates big problem

the issue is when child crosses some safety location marked by parents. It won't send message to parents if location not mapped correctly problem occurs

the boundaries of the problem is delay in communication.

the boundaries and the correct mapping to the location.

it affects the child's future.

the boundary of the problem is battery.

the issue is the parent doesn't know panic situation of child

#### GEETHA

The device materials can vomit hazardous rays

The child's current activity cannot be notified

Parents have fear about the child

The health of the child to be considered

We concentrate on the gps and other communication devices in lot

The issue occurring in pointing the location of child

If the tracking is lost the child's place is unidentified. So, we focus on other way.

If the communication between child and parents where disconnected

The child's gps not work we can't identify the place of the child

The child location only tracked by gps

The issue was the location was not find

The rays causes health issues

#### BARATHAN

does they get an incorrect information

may be the child informations are interrupted

body temperature, pulse rate may be incorrect

Child's body temperature may affect by device temperature

To know the childrens location if they are missing

to know the health information of the child

to reduce interrupt to get correct information of the child

#### NAGARAJ

The performance will be difficult to maintain.

We can only view the last active location of the child.

The parents will be mentally affected and child will be lost.

When the database crashes.

To ensure that the child is safe & sound.

Data & information are not able to read/write.

When child is unsafe.

Surrounding around the child.

Where the place cannot recharge the device.

In order to get the information about child safety works smoothing & accurately.

### 3.3 PROPOSED SOLUTION

**Proposed Solution Template:**

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<p>Basically, children cannot complain about abusement which they face in their daily life to their parents. They can't even realize what actually happens to them at their age. It is also difficult for parents to identify their children are being abused.</p> <p>Since to prevent children before being attacked. Child goes missing in this world.</p> <p>To protect them in school , outside the house, when crossing road and respective environment .</p>
2.	Idea / Solution description	<p>In this system, the collected values from every sensor like temperature sensor, pulse rate detection sensor, metal detection sensor, and the location value from GPS are used to detect the status of the child and alerts the respective guardians using GSM accordingly.</p> <p>This paper presents a system to monitor pick-up/drop-off of school children to enhance the safety of children during daily transportation from and to school. The system consists of two main units, a bus unit, and a school unit. The bus unit the system is used to detect when a child boards or leaves the bus. This information is communicated to the school unit that identifies which of the children did not board or leave the bus and issues an alert message accordingly the aim of this work is to develop a wearable device for the safety and protection of women and girls.</p> <p>This objective is achieved by the analysis of physiological signals in conjunction with body position. The physiological signals that are analyzed are galvanic skin resistance and body temperature. Body position is determined by acquiring raw accelerometer data from a triple axis accelerometer.</p> <p>A portable device which will have a pressure switch. As soon as an assailant is about to</p>

		<p>attack the person or when the person senses any insecurity from a stranger, he/she can then put pressure on the device by squeezing or compressing it. Instantly the pressure sensor senses this pressure and a conventional SMS, with the victim's location will be sent to their parents/guardian cell phone numbers stored in the device while purchasing it, followed by a call. If the call is unanswered for a prolonged time, a call will be redirected to the police and the same message will be sent. Additionally, if the person crosses some area which is usually not accessed by the person then a message with the real-time location is sent to the parent/guardian's phone via conventional SMS.</p>
3.	Novelty / Uniqueness	<p>RFID-based System for School Children Transportation Safety Enhancement. Design and Development of an IOT based wearable device for the Safety and Security of women and girl children. Smart Intelligent System for Women and Child Security</p>
4.	Social Impact / Customer Satisfaction	<p>increased fear, guilt and self-blame. distrust of adults or difficulty forming relationships with others. disrupted attachments with those who are meant to keep them safe. mental health disorders such as anxiety, attachment, post-traumatic stress and depression disorders.</p>
5.	Business Model (Revenue Model)	<p>The model of the gadget is wearable device. Like watch , pendent and other models. That consist the GPS to track the location of the person . If it is business model we first consider about cost and the gadget is not harmful to health. Because the device was used by the person in 24 hours.</p>
6.	Scalability of the Solution	<p>The scalability we can use the gadget in 24 hours. That sense and sends the information to the parents and guardians to the right ways. To ensure that it works in the day full. This is the scalability of the gadget</p>



## 3.4 PROBLEM SOLUTION FIT

Define CS, fit into CC	<b>1.CUSTOMER SEGMENT</b> <ul style="list-style-type: none"> <li>• Caretaker</li> <li>• Parent</li> </ul>	<b>6.CUSTOMER CONSTRAINTS</b> <ul style="list-style-type: none"> <li>• Easy to use</li> <li>• compatible and weightless</li> <li>• low cost</li> </ul>	<b>5.AVAILABLE SOLUTION</b> <ul style="list-style-type: none"> <li>• Knowledge about setting geofence</li> <li>• Device</li> <li>• Internet</li> </ul>	Explore AS, differentiate
Focus on J&P, tap into BE, understand RC	<b>2. JOBS -TO- BE-DONE/ PROBLEMS</b> <ul style="list-style-type: none"> <li>• To manage data store</li> <li>• network connectivity?</li> <li>• To alert the parents in case of emergency</li> </ul>	<b>9. PROBLEM ROOT CAUSE</b> <ul style="list-style-type: none"> <li>• Crimes</li> <li>• missing children</li> <li>• Irresponsible parents</li> </ul>	<b>7.BEHAVIOUR</b> <p>Tracking devices for kids provide you with real-time GPS details of your child's location. This is extremely useful tool when your child is walking to a friends house from any instant distance where your child's current whereabouts could be uncertain.</p>	Focus on J&P, tap into BE, understand RC
Identify strong TR & EM	<b>3. TRIGGERS</b> <ul style="list-style-type: none"> <li>• social media neighbour</li> <li>• places fear of losing child</li> </ul> <b>4.EMOTIONS: BEFORE/ AFTER</b> <ul style="list-style-type: none"> <li>• Parents are panic that they lost the child</li> <li>They fell happy after they find the child</li> </ul>	<b>10. YOUR SOLUTION</b> <ul style="list-style-type: none"> <li>• Gadget ensure the safety and tracking of children.</li> <li>The android app use GPS and mobile service to find the child location and secretly stored accurate location without knowing the children</li> </ul>	<b>8 CHANNELS of BEHAVIOR</b> <b>81 ONLINE</b> <ul style="list-style-type: none"> <li>• web applicationGPS module communication</li> </ul> <b>82 OFFLINE</b> <ul style="list-style-type: none"> <li>• Distance Calculations gadget using time</li> </ul>	Extract online & offline CH of BE

## 4. REQUIREMENT ANALYSIS

### 4.1 FUNCTIONAL REQUIREMENT

**Functional Requirements:**

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Notification	Notified via Mobile App
FR-4	User Interface	Mobile App- MIT App Inventor Able to see location of children when they are out of geofence

## 4.2 NON-FUNCTIONAL REQUIREMENTS

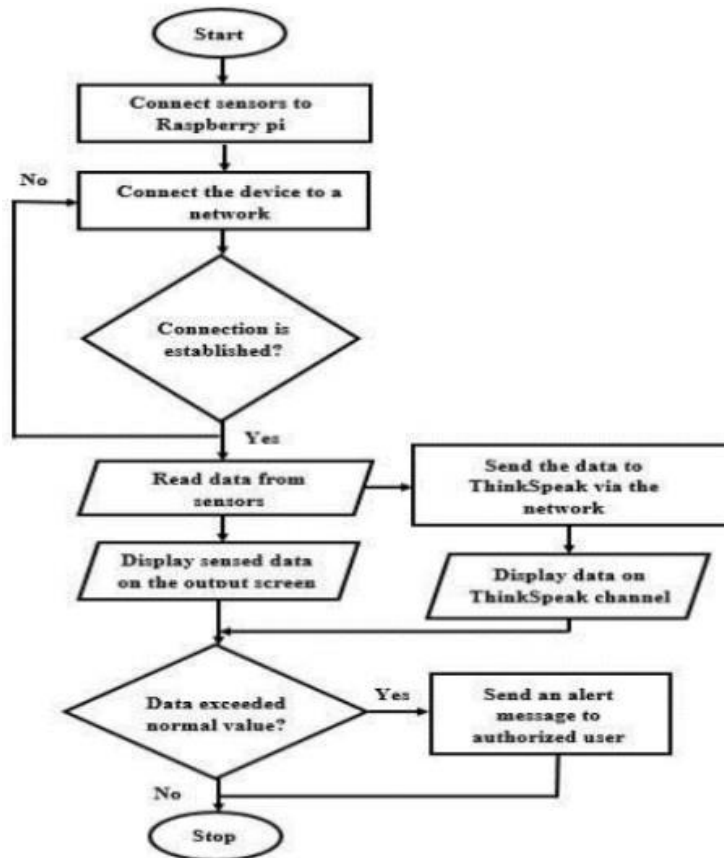
**Non-functional Requirements:**

Following are the non-functional requirements of the proposed solution.

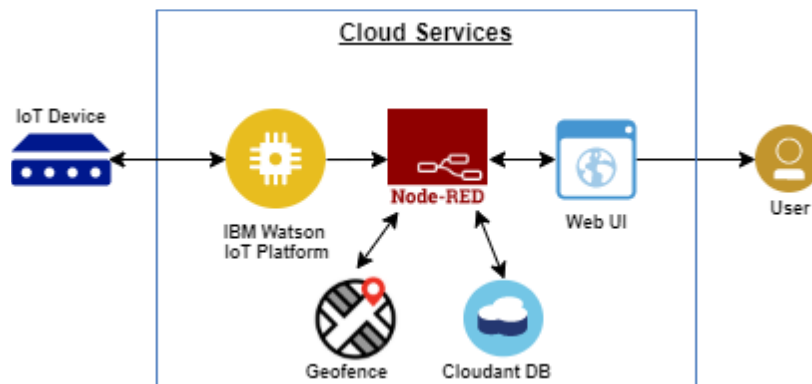
FR No.	Non-Functional Requirement	Description
NFR-1	<b>Usability</b>	Accessed through Mobile App Showing location (latitude and longitude) of child
NFR-2	<b>Security</b>	Database security must meet HIPAA requirements
NFR-3	<b>Reliability and Availability</b>	Once logged in ,webpage is available until logging out of the app
NFR-4	<b>Performance</b>	Each page must load within 2 seconds
NFR-6	<b>Scalability</b>	The process must finish within 3 hours so data is available by 8 a.m. local time after an overnight update

## 5. PROJECT DESIGN

### 5.1 DATA FLOW DIAGRAMS



### 5.2 SOLUTION & TECHNICAL ARCHITECTURE



### 5.3 USER STORIES

List all the user stories for the product.

<b>USER STORY NUMBER</b>	<b>USER STORY/ TASK</b>	<b>ACCEPTANCE CRITERIA</b>	<b>PRIORITY</b>
USN-1	To use the product when the child needs safety	Parents can access the device with lock	HIGH
USN-2	Notification will be provided when child is in trouble.	Child cannot access the device as there is a lock	HIGH
USN-3	To safeguard the child when in danger using GPS they can track their location.	Lock Access Only by parents.	LOW
USN-4	During Emergency there will be alarm	Lock Access Only by concerned persons.	MEDIUM
USN-5	When child is missing parents will be notified	Lock Access Only by Users.	HIGH

## 6. CODING & SOLUTIONING

### 6.1 FEATURE 1

1. HTML
2. JAVA SCRIPT
3. CSS
4. PYTHON

### 6.2 FEATURE 2

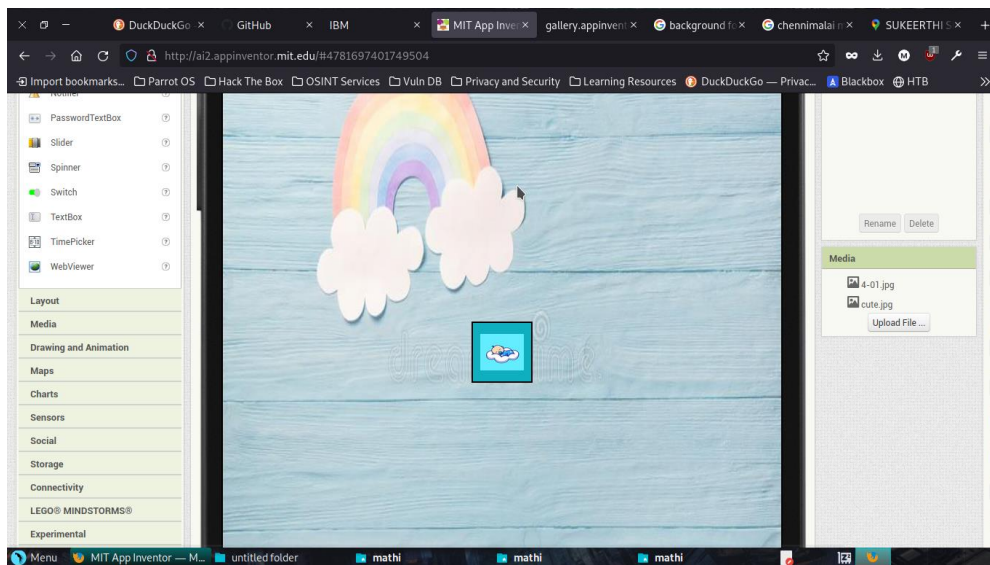
S.NO	COMPONENT	DESCRIPTION	TECHNOLOGY
01	User Interface	The communication protocol being used in the proposed solution might act as an interface the way like wifi, bluetooth	MIT APP
02	Application logic	The data to be collected and send to the authenticator via GSM providing the GPS coordinates to easily located access and monitor the child	IBM Watson STT service,python etc
03	Database	Date to be segregated and secured in the form of re-	MySQL

		lation DBMS	
04	Cloud Database	IBM	IBM Cloudant
05	File storage	File storage requirements	IBM block storage or other storage service or local filesystem
06	External API-1	To access the children location	GPS location monitoring etc
07	Infrastructure	Application deployment on local system/ cloud local server configuration	Cloud foundry

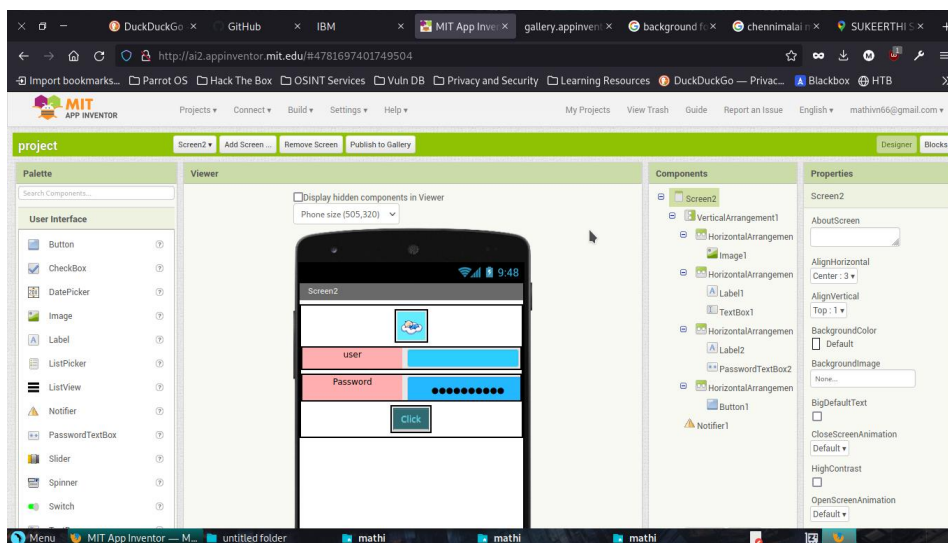
## 7. TESTING

### 7.1 USER ACCEPTANCE TESTING

#### MIT APPLICATION INTERFACE

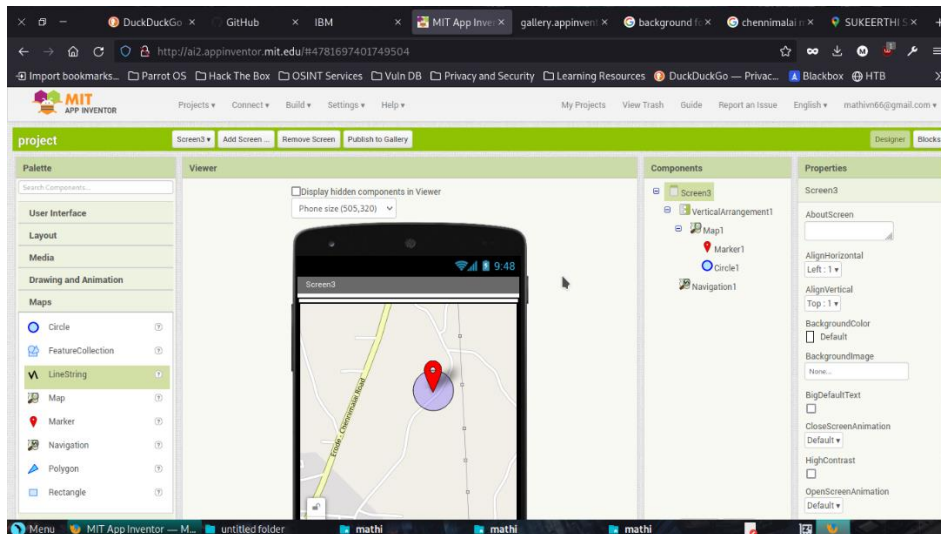


## PARENTAL CONTROL INTERFACE

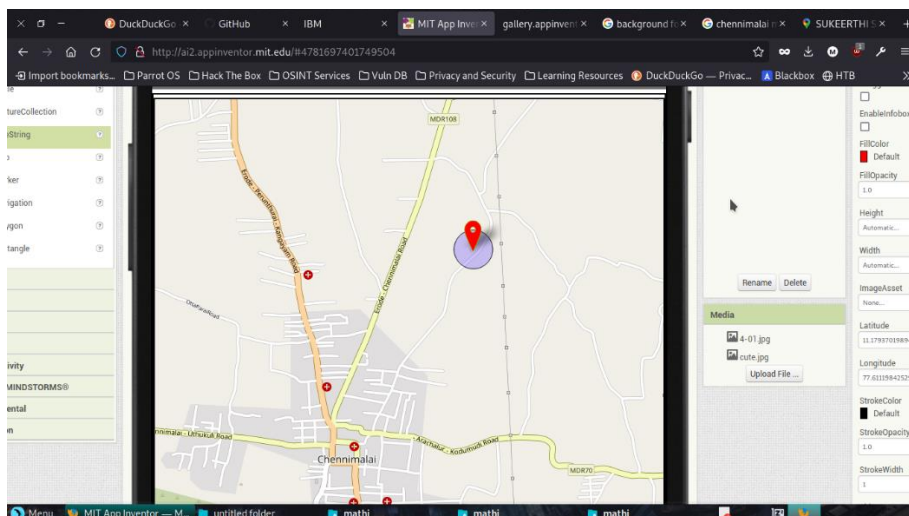


# OUTPUT

## LOCATION STATUS OF CHILD (EMULATOR)



## LOCATION STATUS OF CHILD (MONITOR)





## BLOCK DIAGRAM



## 8. ADVANTAGES & DISADVANTAGES

### ADVANTAGES:

- ✓ Provide safety to the child by allowing their parent to locate.
- ✓ This application can be used to monitor the temperature and motion of the child.
- ✓ Child safety can be ensured and crime rate against the child can be reduced.
- ✓ It can be used to analyze the dynamic environment of the child and alerting system.

## **DISADVANTAGES:**

- Technical difficulties.
- High cost and difficult to implement.
- Poor data quality.
- Design quality.

## **9. CONCLUSION**

This concept demonstrates IoT based gadget for child safety monitoring and notifications is helping the parent to locate and monitor their children. If any abnormal values are read by the sensor then an SMS is sent to the parents mobile. It assists parents to monitor their children remotely. The project aims to create a system that allows the parents to keep track their children when they are out of their sight. This is done by using the IBM cloud, Node-red and IBM Watson which is used to create and store the informations of the project. The child will wear GPS enabled device which is connected to the parent's smart phone where the child safety web-application is installed.

## 10. FUTURE SCOPE

In this web-application if any abnormalities are read by the sensor an MMS indicating an image or video captured by the serial camera which is to be included with emergency and safety system for accurate surveillance of the child's surroundings. The future scope of the work is to implement the IoT device which ensures the complete solution for child safety problems.

For this project using the GSM technologies is beneficial as the cellular range is vast and since all the communication between wearable device and the parent is taking place via SMS, therefore no internet connectivity is required. But, still the GSM module possess the added advantage of using GPRS which enables the board to use the internet if required. Whereas for camera module which supports video streaming but due to the constraint of trying to use only SMS, therefore more number of connections will be taking place.

## 11.APPENDIX

### SOURCE CODE

```
from __future__ import absolute_import, division, unicode_literals
try:
    from collections.abc import MutableMapping
except ImportError: # Python 2.7
    from collections import MutableMapping
from xml.dom import minidom, Node
```

```

import weakref

from . import base
from .. import constants
from ..constants import namespaces
from ..utils import moduleFactoryFactory

def getDomBuilder(DomImplementation):
    Dom = DomImplementation

    class AttrList(MutableMapping):
        def __init__(self, element):
            self.element = element

        def __iter__(self):
            return iter(self.element.attributes.keys())

        def __setitem__(self, name, value):
            if isinstance(name, tuple):
                raise NotImplementedError
            else:
                attr = self.element.ownerDocument.createAttribute(name)
                attr.value = value
                self.element.attributes[name] = attr

        def __len__(self):
            return len(self.element.attributes)

        def items(self):
            return list(self.element.attributes.items())

        def values(self):
            return list(self.element.attributes.values())

        def __getitem__(self, name):
            if isinstance(name, tuple):
                raise NotImplementedError
            else:
                return self.element.attributes[name].value

        def __delitem__(self, name):
            if isinstance(name, tuple):
                raise NotImplementedError
            else:
                del self.element.attributes[name]

    class NodeBuilder(base.Node):
        def __init__(self, element):
            base.Node.__init__(self, element.nodeName)
            self.element = element

        namespace = property(lambda self: getattr(self.element, "namespaceURI") and
            self.element.namespaceURI or None)

```

```

def appendChild(self, node):
    node.parent = self
    self.element.appendChild(node.element)

def insertText(self, data, insertBefore=None):
    text = self.element.ownerDocument.createTextNode(data)
    if insertBefore:
        self.element.insertBefore(text, insertBefore.element)
    else:
        self.element.appendChild(text)

def insertBefore(self, node, refNode):
    self.element.insertBefore(node.element, refNode.element)
    node.parent = self

def removeChild(self, node):
    if node.element.parentNode == self.element:
        self.element.removeChild(node.element)
    node.parent = None

def reparentChildren(self, newParent):
    while self.element.hasChildNodes():
        child = self.element.firstChild
        self.element.removeChild(child)
        newParent.element.appendChild(child)
    self.childNodes = []

def getAttributes(self):
    return AttrList(self.element)

def setAttributes(self, attributes):
    if attributes:
        for name, value in list(attributes.items()):
            if isinstance(name, tuple):
                if name[0] is not None:
                    qualifiedName = (name[0] + ":" + name[1])
                else:
                    qualifiedName = name[1]
                self.element.setAttributeNS(name[2], qualifiedName,
                                              value)
            else:
                self.element.setAttribute(
                    name, value)
    attributes = property(getAttributes, setAttributes)

def cloneNode(self):
    return NodeBuilder(self.element.cloneNode(False))

def hasContent(self):
    return self.element.hasChildNodes()

def getNameTuple(self):
    if self.namespace is None:
        return namespaces["html"], self.name
    else:

```

```

        return self.namespace, self.name

    nameTuple = property(getNameTuple)

class TreeBuilder(base.TreeBuilder): # pylint:disable=unused-variable
    def documentClass(self):
        self.dom = Dom.getDOMImplementation().createDocument(None, None, None)
        return weakref.proxy(self)

    def insertDoctype(self, token):
        name = token["name"]
        publicId = token["publicId"]
        systemId = token["systemId"]

        domimpl = Dom.getDOMImplementation()
        doctype = domimpl.createDocumentType(name, publicId, systemId)
        self.document.appendChild(NodeBuilder(doctype))
        if Dom == minidom:
            doctype.ownerDocument = self.dom

    def elementClass(self, name, namespace=None):
        if namespace is None and self.defaultNamespace is None:
            node = self.dom.createElement(name)
        else:
            node = self.dom.createElementNS(namespace, name)

        return NodeBuilder(node)

    def commentClass(self, data):
        return NodeBuilder(self.dom.createComment(data))

    def fragmentClass(self):
        return NodeBuilder(self.dom.createDocumentFragment())

    def appendChild(self, node):
        self.dom.appendChild(node.element)

    def testSerializer(self, element):
        return testSerializer(element)

    def getDocument(self):
        return self.dom

    def getFragment(self):
        return base.TreeBuilder.getFragment(self).element

    def insertText(self, data, parent=None):
        data = data
        if parent != self:
            base.TreeBuilder.insertText(self, data, parent)
        else:

            if hasattr(self.dom, '_child_node_types'):

                if Node.TEXT_NODE not in self.dom._child_node_types:

```

```

        self.dom._child_node_types = list(self.dom._child_node_types)
        self.dom._child_node_types.append(Node.TEXT_NODE)
        self.dom.appendChild(self.dom.createTextNode(data))

implementation = DomImplementation
name = None

def testSerializer(element):
    element.normalize()
    rv = []

def serializeElement(element, indent=0):
    if element.nodeType == Node.DOCUMENT_TYPE_NODE:
        if element.name:
            if element.publicId or element.systemId:
                publicId = element.publicId or ""
                systemId = element.systemId or ""
                rv.append("""|%s<!DOCTYPE %s "%s" "%s">""" %
                    (' ' * indent, element.name, publicId, systemId))
            else:
                rv.append("""|%s<!DOCTYPE %s>""" % (' ' * indent, element.name))
        else:
            rv.append("""|%s<!DOCTYPE >""" % (' ' * indent,))
    elif element.nodeType == Node.DOCUMENT_NODE:
        rv.append("#document")
    elif element.nodeType == Node.DOCUMENT_FRAGMENT_NODE:
        rv.append("#document-fragment")
    elif element.nodeType == Node.COMMENT_NODE:
        rv.append("""|%s<!-- %s -->""" % (' ' * indent, element.nodeValue))
    elif element.nodeType == Node.TEXT_NODE:
        rv.append("""|%s\"%s\"""" % (' ' * indent, element.nodeValue))
    else:
        if (hasattr(element, "namespaceURI") and
            element.namespaceURI is not None):
            name = "%s %s" % (constants.prefixes[element.namespaceURI],
                element.nodeName)
        else:
            name = element.nodeName
        rv.append("""|%s<%s>""" % (' ' * indent, name))
        if element.hasAttributes():
            attributes = []
            for i in range(len(element.attributes)):
                attr = element.attributes.item(i)
                name = attr.nodeName
                value = attr.value
                ns = attr.namespaceURI
                if ns:
                    name = "%s %s" % (constants.prefixes[ns], attr.localName)
                else:
                    name = attr.nodeName
                attributes.append((name, value))

            for name, value in sorted(attributes):
                rv.append("""|%s%s="%s" """ % (' ' * (indent + 2), name, value))
            indent += 2

```

```
        for child in element.childNodes:
            serializeElement(child, indent)
        serializeElement(element, 0)

    return "\n".join(rv)

return locals()

getDomModule = moduleFactoryFactory(getDomBuilder)
```

## **DEMO LINK**

<http://ai2.appinventor.mit.edu/#4781697401749504>